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NUEXCO

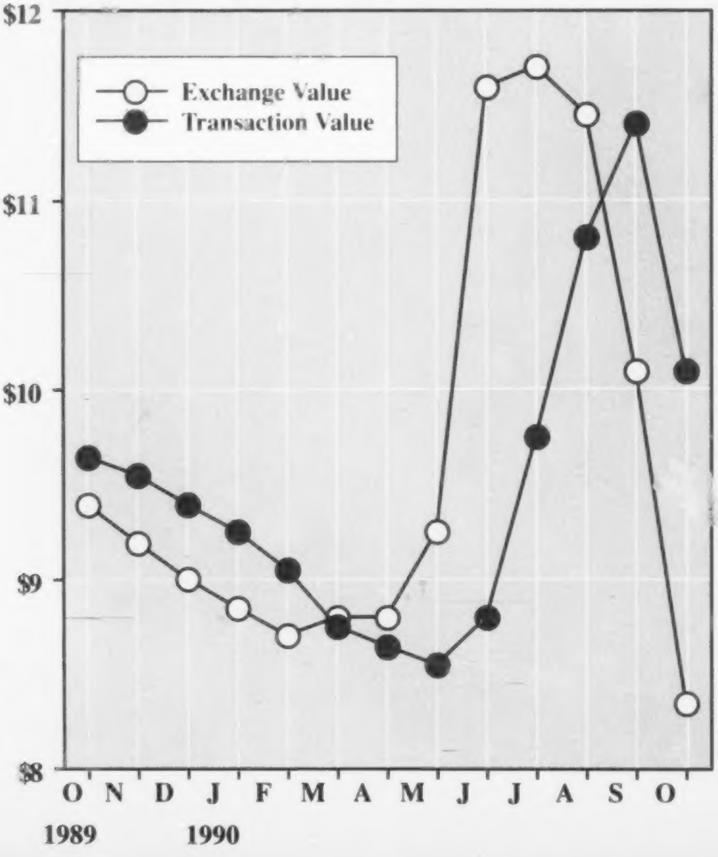
Monthly Report

November 1990 Number 267

Taxation And Regulation of Uranium Mining in Canada 19

Pribram Uranium District 27

Uranium Exploration and Development Update 32



NUEXCO

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Other NUEXCO Publications:
Annual Review;
Nuclear Fuel Market Study;
International Directory of
Nuclear Utilities (IDNU);
International Directory of
Uranium Producers (IDUP)

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- **Taxation and Regulation of Uranium Mining in Canada**

Government taxation and regulation profoundly influence uranium operations. Mineral rights, licensing, and occupational health and safety are both federally and provincially regulated, sometimes leading to conflicting or overlapping jurisdiction.

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Exploration activity in Canada is at very low levels, but even so, a new, world-class deposit has been discovered. Work continued on a number of projects, while several mines cutback or closed operations.

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NUEXCO

To Our Readers

NUEXCO is proud to report three noteworthy service anniversaries.

Lindy Lindberg — 20 years
Wayne Fowler — 15 years
Jim Vaughan — 15 years

Lindy marked his 20th year with NUEXCO on November 1. In what would be a career for many, Lindy's accomplishment comes on top of 42 years with General Electric. He recently celebrated his 85th birthday and is still active in day to day market activities as NUEXCO's representative to 14 US utilities. We congratulate him on this tremendous achievement.

Wayne celebrated his 15th year with NUEXCO on October 20. Today he is involved with the organization in a managing and advisory capacity to several CONCORD entities.

Jim will complete his 15th year with the company this coming January. A senior vice–president of NUEXCO, he has been in our Geneva, Switzerland office for eight years.

The CONCORD/NUEXCO organization is proud of the achievements of these men and the experience they bring to the company. We congratulate them on their accomplishments.

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NUEXCO

November 1990
No. 267

MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report October 31, 1990	Last Report September 30, 1990	12 Months Ago October 31, 1989
EXCHANGE VALUE[1]	**\$8.35**/lb equivalent U_3O_8	\$10.10	\$9.40
UF_6 VALUE[2]	**\$24.75**/kg U as UF_6	\$29.50	\$28.25
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.45**/lb U as UF_6	\$1.45	\$1.80
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$51**/SWU	\$50	\$59
TRANSACTION VALUE[6]	**\$10.10**/lb equivalent U_3O_8	\$11.40	\$9.65
Transactions	12	15	17
Months	3	3	4
Millions of Pounds	2.3	3.7	2.5

DEFINITIONS

1 The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

2 The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

3 The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

4 The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

5 The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

6 The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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OCTOBER MARKET REVIEW

(as of October 31, 1990)

OVERVIEW

Throughout the month, uranium suppliers competed aggressively in a market characterized by ample supply and limited sales opportunities. The Exchange Value and UF_6 Value both registered record decreases. The Exchange Value fell to $8.35 per pound U_3O_8 which, after adjustment for inflation, is its lowest level ever. The UF_6 Value recorded its largest drop ever, falling $4.75, to $24.75 per kgU as UF_6.

Seven near-term uranium sales totalling 1.2 million pounds equivalent U_3O_8 are reported (**Table 1**). Four sales involved concentrates, while the three others involved natural UF_6. No enriched uranium product (EUP) sales are reported. Additionally, three long-term natural uranium sales totalling 3.4 million pounds equivalent U_3O_8 are reported.

The Loan Rate and Conversion Value remain unchanged at 3.5 percent per annum, and $1.45 per pound U as UF_6, respectively. The SWU Value edged upward one dollar, to $51 per SWU. There was one transaction in each of the loan, conversion, and SWU markets. The one loan involved over one million pounds equivalent U_3O_8, and the conversion sale exceeded 300 thousand pounds U. The solitary enrichment sale involved a small quantity of SWU sold at a price near the October 31 SWU Value.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	October 1990		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	4	0.7	54	20.8
Natural UF_6	3	0.5	30	10.0
EUP	0	0.0	11	4.5
Total	**7**	**1.2**	**95**	**35.3**

[1] million pounds equivalent U_3O_8

NATURAL URANIUM AND CONVERSION

The **Exchange Value** fell to its lowest level ever in constant 1990 dollars, sinking $1.75, to **$8.35** per pound U_3O_8. This 17% decline represents the largest percentage drop in its 22-year history. Offering prices decreased rapidly during the month as sellers competed aggressively for the few sales opportunities, even to the point of contacting buyers after bid deadlines had expired and offering to lower prices further. Market prices fell rapidly both in Europe and North America, but prices tended to be slightly higher in Europe. Offered prices fell quickly, even further than the already reduced levels that prevailed in sales concluded in the latter half of the month. Thus, the October 31 Exchange Value is based primarily on evidence of offers to sell near the $8.35 level as of the end of the month.

The four concentrates sales reported this month total nearly 700 thousand pounds U_3O_8. North American and European market participants were active in October, both as buyers and sellers of concentrates.

As the Exchange Value has fallen to record low levels, traditional market roles have changed; some traditional sellers have become buyers, some traditional buyers have withdrawn from the falling market in anticipation of even lower prices, while other buyers have re-entered the market to make discretionary purchases.

* * *

The **UF_6 Value** continued its precipitous decline, falling sharply to **$24.75** per kgU as UF_6. This $4.75 (16%) tumble marks the second consecutive record drop in the UF_6 Value, both in absolute and percentage terms, since its initial publication on April 30, 1985. The UF_6 market displayed characteristics similar to the concentrates market: limited sales opportunities, abundant supply, low offering prices, and aggressive seller competition. While market price levels continue to decline, by the end of the

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Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply [1]	Active Demand [1]
• Natural Uranium [2] (thousand lbs equivalent U_3O_8)	4,375	1,420
• Supply/Demand Ratio:	3.1	
• Loan (thousand lbs equivalent U_3O_8)	9,605	0
• Conversion (thousand lbs U as UF_6)	1,650	210
• SWU (thousand SWUs)	435	208

[1] Supply and demand tables in the current market data section of this Report provide details for each category.
[2] Includes concentrates and hexafluoride.

month their rate of descent seemed to have eased compared to the rate at which prices plummeted during the early and middle weeks of October. However, just as with concentrates, the rapidity of the decrease, combined with the unpredictability of market participants' behavior at these low price levels, makes the market even more complex.

Three spot UF_6 sales are reported. Three US utilities purchased a total of 500 thousand pounds equivalent U_3O_8 for delivery in December of this year. One sale occurred earlier in the month at a price well below the September 30 UF_6 Value, but still above the October 31 UF_6 Value. The other two sales occurred later in the month at price levels near the October 31 UF_6 Value.

* * *

The **Transaction Value** decreased to **$10.10** per pound U_3O_8 based on 12 transactions over 3 months involving 2.3 million pounds equivalent U_3O_8. This $1.30 per pound decline reflects the expected downturn of the Transaction Value as more recent, lower-priced transactions are included in the calculation. The Transaction Value will likely move lower in the coming months as previous higher-priced transactions are displaced by current low–priced sales.

* * *

The **supply/demand ratio** declined to **3.1**, based upon an **active uranium supply** of **4.4** million pounds equivalent U_3O_8 and an **active uranium demand** of **1.4** million pounds. While this change shows an increase in demand and a decrease in supply, plentiful supply assures that expected near-term demand will not only be filled, but will be sought after aggressively by suppliers.

* * *

Long-term uranium market activity increased this month as three utilities purchased material totalling over 3.4 million pounds equivalent U_3O_8. Two of the sales involved concentrates purchased under contracts using market-related pricing terms; the other sale involved natural UF_6. Deliveries in these three sales are to occur between 1991 and 1999.

* * *

The **Loan Rate** remains at **3.5** percent per annum. One loan of natural UF_6 is reported. A utility loaned over one million pounds equivalent U_3O_8 to an intermediary at a rate above the prevailing Loan Rate, in exchange for some special considerations granted to the borrower. Loan supply increased to 9.6 million pounds equivalent U_3O_8 (**Table 2**), while no active inquiries to borrow are reported. The abundance of loan material adds to the oversupply situation and puts extra pressure on suppliers already anxious to complete sales.

* * *

The **Conversion Value** is unchanged at **$1.45** per pound U as UF_6. One conversion transaction is reported. A European utility purchased over 300 thousand pounds U as UF_6 from a primary convertor.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** increased one dollar, to **$51** per SWU, reflecting a slight strengthening of the secondary enrichment market. This is the first change in the SWU Value in nine months and its first increase in 22 months. But longer-term concerns about large stockpiles and increased competition from new and emerging suppliers have heightened worries about any permanent price recovery.

One SWU sale is reported this month in which a utility purchased a small quantity of SWU from an intermediary at a level near the October 31 SWU Value. No EUP sales are reported. ■

Table 3
ENRICHMENT PRICES
(October 31, 1990)

Prices	This Month Report 267	Last Month Report 266	12 Months Ago Report 255
NUEXCO SWU Value ($US per SWU)	51	50	59
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U_{235}	190	207	218
2.5 w/o U_{235}	263	285	303
3.0 w/o U_{235}	339	366	389
3.5 w/o U_{235}	416	447	478
4.0 w/o U_{235}	494	530	568
4.5 w/o U_{235}	573	614	659

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Uses Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
4956	1990	Less Than 50	Above 110	Intermediary	Producer	
4958	1991	101-300	103-110	Utility	Intermediary	
4959	1990	50-100	103-110	Utility	Intermediary	UF_6
4961	1990	101-300	Above 110	Producer	Intermediary	
4967	1992-1995	1,001-3,000	**R**	Utility	Producer	UF_6
4968	1992-1994	601-1,000	See Remarks	Utility	Producer	Market Related Pricing
4969	1990	101-300	98-102	Utility	**R**	UF_6
4971	1991-1995	1,001-3,000	See Remarks	Utility	Intermediary	Market Related Pricing
4972	1991	101-300	102-110	Utility	Intermediary	
4973	1990	101-300	98-102	Utility	Converter	UF_6

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
4962	1990	1,001-3,000	Above 110	Intermediary	Utility	UF_6

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
4970	1991-1992	301-600	R	Utility	Converter	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
4960	1990	Less Than 50	98-102	Utility	Intermediary	

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[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale				
ACTIVE				
90-1078A	2,175	2,175 per year	1991-1993	UF_6e
90-1231*	500	500 per year	1990-1995	
90-1249*	700	—	1990-1991	
90-7001	1,000	1,000 per year	1991-1995	
Total	**4,375**			
INACTIVE	**2,350**			
Available for Loan				
ACTIVE				
88-1182*	4,400	—	—	U_3O_8/UF_6
90-1016*	1,000	—	—	U_3O_8
90-1108	1,000	—	—	U_3O_8
90-1180	525	—	—	U_3O_8
90-1208*	280	—	—	UF_6
90-1212	400	—	—	U_3O_8
90-1230	1,000	—	—	U_3O_8
90-1260*	1,000	—	—	UF_6
Total	**9,605**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1227.
Active Projects removed since last month: 89-1001, 90-1033, 90-1110.

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
Inquiries to Purchase:				
ACTIVE				
90-1100A	45	—	1991	UF_{6e}
90-1182	25	—	1991	
90-1229	200	—	1991	
90-1235*	750	—	1991	
90-1258*	100	—	1990	
90-1262*	300	—	1990	
90-1170	—	290	1992-1996	
90-1205	—	260 per year	1992-2001	UF_6
90-1206	—	390 per year	1993-2001	UF_6
90-1226*	—	1,045 per year	1992-1996	UF_6
90-1240*	—	260 per year	1994-1996	U_3O_8/UF_6
90-1241*	—	130 per year	1992-1997	UF_6
90-1254A*	—	250 per year	1993-1996	U_3O_8/UF_6
90-1255*	—	260 per year	1993-2001	UF_6
90-1256*	—	500 per year	1994-1998	U_3O_8/UF_6
Total	**1,420**			
INACTIVE	**1,975**			
Inquiries to Borrow	*No inquiries to borrow are reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 90-1098, 90-1155, 90-1207, 90-1209, 90-1210, 90-1215.

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years[1]	Beyond 3 Years[1]	Remarks
Available for Sale			
ACTIVE			
90-1261*	1,650	—	1991
Total	**1,650**		
INACTIVE	*None reported*		
Inquiries to Purchase			
ACTIVE			
90-1259*	210	—	1991
90-1254C*	—	210	1993-1996
Total	**210**		
INACTIVE	*None reported*		

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1184, 90-1214.

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SUPPLY AND DEMAND

SWU Supply And Demand

	Quantity (Thousand SWUs)			
NUEXCO Project Number	**Spot or Near-term [1]**	**Intermediate or Long-term [2]**	**Delivery Period**	**Remarks**
Available for Sale				
ACTIVE				
90-1078B	435	435 per year	1991-1993	UF_6e
90-7000	—	1,000	1991 on	
Total	**435**			
INACTIVE	*None reported*			
Inquiries to Purchase				
ACTIVE				
90-1100B	15	—	1991	UF_6e
90-1224*	40	100 per year	1991-1995	
90-1225	150	—	1991	
90-1251*	3	—	1991	
88-1061	—	500	1991-1995	
90-1076	—	350 per year	1992-1998	
90-1094	—	500	1992-2000	
90-1144	—	60 per year	1992-2001	
90-1181	—	600	1996-2003	UF_6e
90-1196	—	60 per year	1995 on	
Total	**208**			
INACTIVE	**155**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: *none*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Oct. 31, 1990)	Last Month (Sept. 30, 1990)	12 Months Ago (Oct. 31, 1989)	This Month (Oct. 31, 1990)	Last Month (Sept. 30, 1990)	12 Months Ago (Oct. 31, 1989)
Australia (dollar)	10.65	12.22	12.01	27.69	31.77	31.21
Belgium (franc)	260.12	324.55	362.24	676.27	843.76	941.73
Canada (dollar)	9.74	11.67	11.03	25.33	30.33	28.68
EEC (ecu)	6.16	7.69	8.42	16.02	19.99	21.89
Finland (markka)	30.06	37.37	39.93	78.15	97.15	103.81
France (franc)	42.29	52.73	58.57	109.95	137.09	152.26
Germany (mark)	12.63	15.77	17.25	32.85	40.99	44.84
Italy (lira)	9,465	11,796	12,663	24,607	30,668	32,922
Japan (yen)	1,075	1,393	1,334	2,794	3,622	3,468
Netherlands (guilder)	14.24	17.77	19.47	37.03	46.20	50.61
So. Africa (comm. rand)	21.26	25.96	24.73	55.28	67.50	64.29
Spain (peseta)	791.54	986.81	1,098	2,058	2,565	2,855
Sweden (krona)	46.91	58.01	60.22	121.96	150.82	156.55
Switzerland (franc)	10.70	13.06	15.10	27.81	33.96	39.25
UK (pound)	4.27	5.37	5.94	11.11	13.97	15.45
US (dollar)	8.35	10.10	9.40	21.71	26.26	24.44

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Oct. 31, 1990)	Last Month (Sept. 30, 1990)	12 Months Ago (Oct. 31, 1989)	This Month (Oct. 31, 1990)	Last Month (Sept. 30, 1990)	12 Months Ago (Oct. 31, 1989)
Australia (dollar)	12.88	13.79	12.32	33.49	35.86	32.04
Belgium (franc)	314.64	366.32	371.87	818.00	952.36	966.78
Canada (dollar)	11.79	13.17	11.32	30.64	34.23	29.44
EEC (ecu)	7.45	8.68	8.64	19.38	22.56	22.47
Finland (markka)	36.36	42.18	40.99	94.53	109.66	106.58
France (franc)	51.16	59.52	60.12	133.00	154.74	156.31
Germany (mark)	15.28	17.80	17.71	39.73	46.27	46.03
Italy (lira)	11,449	13,315	13,000	29,764	34,615	33,797
Japan (yen)	1,300	1,573	1,369	3,379	4,088	3,560
Netherlands (guilder)	17.23	20.06	19.99	44.79	52.15	51.96
So. Africa (comm. rand)	25.72	29.31	25.39	66.86	76.19	66.00
Spain (peseta)	957.44	1,114	1,127	2,489	2,896	2,930
Sweden (krona)	56.74	65.48	61.82	147.52	170.23	160.72
Switzerland (franc)	12.94	14.75	15.50	33.64	38.34	40.30
UK (pound)	5.17	6.06	6.10	13.43	15.77	15.86
US (dollar)	10.10	11.40	9.65	26.26	29.64	25.09

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF6 This Month (Oct. 31, 1990)	per lb U as UF6 Last Month (Sept. 30, 1990)	per lb U as UF6 12 Months Ago (Oct. 31, 1989)	per kg U as UF6 This Month (Oct. 31, 1990)	per kg U as UF6 Last Month (Sept. 30, 1990)	per kg U as UF6 12 Months Ago (Oct. 31, 1989)
Australia (dollar)	1.85	1.75	2.30	4.08	3.87	5.07
Belgium (franc)	45.17	46.49	69.36	99.59	102.72	152.92
Canada (dollar)	1.69	1.67	2.11	3.73	3.69	4.66
EEC (ecu)	1.07	1.10	1.61	2.36	2.43	3.55
Finland (markka)	5.22	5.37	7.65	11.51	11.83	16.86
France (franc)	7.34	7.57	11.21	16.19	16.69	24.72
Germany (mark)	2.19	2.26	3.30	4.84	4.99	7.28
Italy (lira)	1,646	1,694	2,425	3,624	3,734	5,346
Japan (yen)	186.62	200.03	255.43	411.42	440.99	563.12
Netherlands (guilder)	2.47	2.55	3.73	5.45	5.63	8.22
So. Africa (comm. rand)	3.69	3.73	4.74	8.14	8.22	10.44
Spain (peseta)	137.45	141.67	210.26	303.03	312.33	463.53
Sweden (krona)	8.15	8.33	11.53	17.96	18.36	25.42
Switzerland (franc)	1.86	1.88	2.89	4.10	4.13	6.37
UK (pound)	0.74	0.77	1.14	1.64	1.70	2.51
US (dollar)	1.45	1.45	1.80	3.20	3.20	3.97

SWU Value And UF6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Oct. 31, 1990)	SWU Value at 0.30 w/o Tails Assay Last Month (Sept. 30, 1990)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (Oct. 31, 1989)	UF6 Value per kg U as UF6 This Month (Oct. 31, 1990)	UF6 Value per kg U as UF6 Last Month (Sept. 30, 1990)	UF6 Value per kg U as UF6 12 Months Ago (Oct. 31, 1989)
Australia (dollar)	65.05	60.50	75.35	31.57	35.69	36.07
Belgium (franc)	1,589	1,607	2,274	771.03	947.94	1,089
Canada (dollar)	59.52	57.75	69.24	28.88	34.07	33.15
EEC (ecu)	37.64	38.06	52.84	18.27	22.45	25.29
Finland (markka)	183.60	185.00	250.64	89.10	109.15	120.00
France (franc)	258.32	261.06	367.60	125.36	154.02	176.01
Germany (mark)	77.17	78.05	108.26	37.45	46.05	51.83
Italy (lira)	57,810	58,398	79,483	28,055	34,455	38,057
Japan (yen)	6,564	6,898	8,372	3,185	4,070	4,009
Netherlands (guilder)	87.00	87.98	122.20	42.22	51.91	58.51
So. Africa (comm. rand)	129.87	128.53	155.22	63.03	75.84	74.32
Spain (peseta)	4,835	4,885	6,892	2,346	2,882	3,300
Sweden (krona)	286.52	287.19	377.96	139.04	169.44	180.97
Switzerland (franc)	65.33	64.67	94.76	31.71	38.16	45.37
UK (pound)	26.09	26.60	37.31	12.66	15.69	17.86
US (dollar)	51.00	50.00	59.00	24.75	29.50	28.25

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[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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RECENT DEVELOPMENTS

Japan

1990 REPORT ON ATOMIC ENERGY

In October, the Japanese government released its annual report on the status of nuclear power and the government's position on nuclear power's future. The following are some of its most interesting points, edited from an English-language summary.

The World Energy Situation

- World energy demand will continue to grow steadily. Demand of developing countries will increase markedly.
- Conditions in the world oil market are feared to worsen, and a continuing increase in the world's dependence on OPEC oil is expected.
- The Japanese government recognizes the international appeals for concerted efforts to be made on the world's environmental issues, particularly the greenhouse effect.
- Because of the continuing growth in energy demand, the dependence on oil from the volatile Middle East, and the increasing international concern over environmental issues, there is every reason to believe nuclear power will continue to occupy an important position as a world energy source.

Nuclear Power Generation Trends in Japan

- Domestic energy demands, particularly for electricity, have been growing steadily.
- Japan is facing a crisis in energy supply and demand, as exemplified by increasing prices of oil from the Middle East, and big summer increases in electrical demand.
- Future dependence on non-fossil fuels should be increased. Domestic nuclear power should generate 50,500,000 kWe in 2000, and 72,500,000 kWe by 2010.
- A program to respond to environmental problems (titled: Action Program to Prevent Greenhouse Effects) is in the planning stage.
- As a result of the recent energy situation, the importance of nuclear power is increasing significantly. Therefore, there is a need to steadily carry out nuclear development and utilization.

Safety Assurance and Public Understanding

- To foster the public's trust in the safety of nuclear power, there is a need to accumulate practical evidence of safety assurance. This will certainly require:
  - — thorough inquiries into the causes of problems;
  - — timely, official announcements of the inquiries' results
- Positive public awareness about nuclear power safety is enhanced by publicity activities and public dialogue. Industry must make a maximum effort to provide the public with accurate and easily-understood information.

Completing the Nuclear Fuel Cycle in Japan

- Because recycled fuel is a semi-domestic energy source, and the control and disposal of nuclear waste is feasible when the waste is in a compact form, it is imperative to develop a reprocessing-recycling system. Japan must strengthen its technological foundation for this system.
- Besides the research efforts in the development of practical fast-breeder reactors, research efforts are progressing on the utilization of plutonium in light-water reactors (LWR). The use of proper containment methods, and current radiation-control technologies are what make the use of plutonium LWRs feasible. By the middle of this century, the development of the practical use of plutonium in LWRs should be completed.
- The transportation of plutonium from overseas reprocessing facilities will be necessary in 1993.
- Low-level radioactive waste will be contained in cement, and then buried underground.
- High-level radioactive waste will be vitrified, then stored for 30-50 years until cool, and then buried several hundred meters underground.
- The programs for the reprocessing of spent fuel as that relates to the Non-Proliferation Treaty concerns other countries. Japan must make a particular effort to elicit the understanding of these countries, with respect to Japan's commitment to the safe and secure handling of plutonium, and its use solely for peaceful purposes. ☐

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RECENT DEVELOPMENTS

Australia

Recent Events Suggest Possible Policy Change

Recent events in Australia have led to a growing expectation of the likelihood of changes in, or a more flexible interpretation of, the federal government's uranium policy, particularly its three mines policy. These events include: the announcement by the Industry Commission of its finding that "development of uranium mines in Australia should be a matter for commercial decisions." The Commission, which is the government's main advisor on micro-economic reform matters, stated that it was hard to find any clear rationale for the three mines policy, and that there were "no persuasive reasons why other uranium mines could not operate under the strict environmental controls and safeguards which currently apply to existing Australian operations and exports."

Second, the aggregate purchase, by three ERA shareholders (North Broken Hill Peko Ltd., Cogema, and Rheinbraun) of more than 31 percent of Pancontinental Mining Ltd. This is seen as a strategic move designed to position ERA so that, following any change in government's uranium policy, it could pressure Pancontinental to sell or share control of its huge Jabiluka deposit which is located near ERA's existing Ranger operation.

Third, Mrs. Ros Kelly, the government's Minister for the Environment garnered extensive headlines and surprised many when she indicated that, provided that strict environmental standards were met, she could support mining, including uranium mining, even in such environmentally sensitive areas as the Northern Territory's Kakadu National Park. In an apparent bow to reality, Mrs. Kelly said Australians needed to face the fact that their "country is based to a great degree on resource development."

Only time will tell if these events were precursors of change or spurious occurrences. ■

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WASHINGTON FOCUS

The 101st Congress finally adjourned on October 28th after passing a deficit reduction package and a budget for FY 1991, as well as a Clean Air bill. The utility industry was an easy target for Congressional fundraising, and as a result of these new laws, utilities will be required to pay increased user fees and taxes, and incur additional expenses to meet new emission control requirements. The uranium enrichment restructuring bill was attached to the Senate version of the deficit reduction legislation, but was not included in the final bill.

House Uranium Enrichment Restructuring Hearing

◇ Uranium enrichment issues were discussed for much of the month. The House Science, Space & Technology Committee held a hearing on October 11th. The National Taxpayers Union (NTU) held a press conference prior to the hearing which received considerable media coverage. Consequently, more attention has been focused on this issue in the House than it has received in the past. Unfortunately, NTU's message is that DOE's request for legislation to permit the restructuring of the uranium enrichment program is a taxpayer subsidy similar to the bailout of the S&L industry. The NTU asserts because of unknown financial risks such as the expense of D&D and environmental clean-up of the GDPs, along with the risks of deploying a new technology (AVLIS), the restructuring of DOE's program into a government corporation should not be permitted. Rep. Marilyn Lloyd (D-TN), as well as several other witnesses, pointed to the recent contract between the Yankee utilities and the Soviets for enrichment services as a primary reason for Congress to allow DOE to restructure in order to help preserve their US marketshare. Chairman Robert Roe (D-NJ) concluded the hearing with the comment that educating the members of the House of Representatives on the urgency of the issue, in order to move this bill, should be the priority of industry and DOE in the next session.

Enrichment Bill on Budget Reconciliation

◇ Toward the end of the month, there was some hope that Congress would pass enrichment restructuring legislation this year. Senator Wendell Ford (D–KY) attached S 83 to several unrelated bills, but was not successful, then he amended S 83 to the budget reconciliation bill. In order to gain Senate Budget committee approval for this amendment, S 83 had to be ruled as a revenue raiser and not a revenue loss for the Treasury for the FY91–95 period. The committee's solution to raise $500 million over five years was to add a 0.2 mill/kWh fee to pay for D&D of the GDPs. A conference committee consisting of five Senators and nine Representatives (from the energy committees) met to discuss the issue. A number of alternatives were discussed, but none were satisfactory to a majority of the House members. Consequently, S 83 was removed from the budget reconciliation bill, but only after Sen. Ford won a concession from Rep. Philip Sharp (D-IN) that his committee will hold a hearing on an enrichment restructuring bill in the first quarter of next year.

Energy Appropriations Bill

◇ In addition to the budget bill, which determines the overall guidelines for government spending, Congress also passed 13 appropriations bills, which allocate the funds within each category to the individual programs. HR 5019, which authorizes spending for energy programs, passed Congress on October 19, although the President has not yet signed the bill into law. DOE's uranium enrichment program received $1.34 billion based on anticipated revenue of $1.45 billion and

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permission to spend $154.5 million on AVLIS. (See the NUEXCO August Monthly Report #264, p.16 for more information). Congress also authorized DOE's reprogramming request, allowing $16 million of the uranium enrichment funds to be transferred to accounts for the restart of Savannah River, and certification of advanced reactor designs.

Overall, Congress was generous with nuclear programs funding. The $20 billion energy appropriations bill contains a 20% increase in funding for civilian advanced reactor programs, funding to keep the Fast Flux Test facility operating, $20 million for the integral fast reactor program, and $3 million for a demonstration project for Sacramento Municipal Utility District to develop spent nuclear fuel dual-use storage casks. The industry was not so fortunate with the NRC appropriation. Congress appropriated $465 million, $10 million less than the NRC requested, and raised user fees to 100% of the budget for the next 5 years; after 1995, the budget returns to its statutory 33% user fee. For an individual utility, this raised fee means an increase from approximately $1.2 million per reactor to $3.6 million per reactor through 1995.

Clean Air Legislation

◇ Congress also enacted clean air legislation which could cost industry and consumers an additional $25 billion per year by 2000. Two areas will affect the nuclear fuel cycle—the acid rain and the air toxic sections. The final bill (which is similar to the Senate-passed bill), through the efforts of Sen. Simpson, attempts to help the industry end dual regulation from the EPA and NRC. The EPA will proceed with its National Emissions Standards for Hazardous Air Pollutants (NESHAPS) rulemaking, and, after two years, the nuclear industry can petition EPA to ask that only NRC regulations govern nuclear facilities. If the industry demonstrates that the NRC rules protect the public's health and safety adequately, then the nuclear industry will not be regulated by EPA any longer. The problem is there is no limit on how long the EPA can consider the petition, so the industry could be litigating or in limbo for a period of time. The issue of the states' authority to implement stricter standards than federal standards was not resolved, and thus states, such as Massachusetts, are free to set stricter standards. Regarding uranium regulation in the new bill, companies are still analyzing the legislative language to determine if there is some assistance in a savings clause which would allow underground and surface mines to follow the regulations specified under the original Clean Air Act, and not the stricter standards imposed by the new bill. Uranium miners were particularly concerned with whether subparts T and W, which regulate radon flux rates from mill tailings ponds, are subject to this savings clause.

The acid rain provisions of the bill also affect DOE's enrichment facilities. The three plants which provide power to the GDPs had been exempt from using emission trading credits in the House bill, but were included in the final bill. The bargain between the House and the Senate gives midwestern utilities more credits to ease the expense of installing scrubbers and switching to low-sulfur coal. The legislation also allows utilities that plan to install scrubbers two additional years (until 1997) to meet the Phase I standards for SOx and NOx emission reductions. DOE's earlier analysis that acid rain legislation will increase SWU costs by about $15/SWU would seem accurate, as the final bill is very similar to the conditions DOE considered in its analysis. The only unknown factor is how much DOE will benefit from the utilities' cost reduction derived from trading emission credits.

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LES Licensing Amendment

◇ One final piece of legislative business regarding the licensing process for enrichment facilities was completed on October 27th. Ironically, an amendment to Public Utilities Regulatory Policy Act (PURPA, HR 4808), which Rep. Sharp sponsored, was held up by Sen. Ford because of Rep. Sharp's unwillingness to negotiate about the uranium enrichment legislation. Louisiana Energy Services (LES) licensing amendment was attached to this bill. This amendment will allow the NRC to license enrichment plants under 10 CFR Parts 40 and 70, rather than Part 50 (materials handling facilities, rather than production reactor regulations). Several changes were made to the original ammendment; an environmental impact statement must be prepared, and one full adjudicatory hearing must be held prior to construction before a license may be granted. The changes are not significant enough to alter the one-step licensing process, but should help alleviate the concerns of the public and the environmentalists about their participation in the process. The NRC has already approved changes to 10 CFR Part 74, to require materials control and accounting at uranium enrichment facilities. The proposed rule should be published in the Federal Register early in November for public comment. The rule will apply to all enrichment facilities, such as an AVLIS facility, and not just to LES. LES indicated that Duke Engineering and Fluor Daniel have been working on the license application and believe their schedule for early 1991 submittal of the license application will not be affected by the Congressional action.

Other Legislation

◇ Congress also raised customs user fees, and passed a hazardous materials transportation bill that strengthens safety requirements for transportation of hazardous and radioactive materials.

Although none of the legislation described in this article has yet been signed into law by President Bush, he is unlikely to veto any of the bills. Considered as a whole, the 101st Congress, while waiting until the last possible moment, has tapped a new money trough, causing financial damage to the pocketbook of nuclear utilities and their ratepayers. ■

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INDUSTRY BRIEFS

President Bush Signs Radiation Victim Compensation Act

President Bush signed into law the legislation that allows victims of radiation from the US nuclear defense programs to receive up to $50,000 compensation. The $100 million fund is for many individuals who lived near Nevada defense sites, and for miners producing uranium for the government's defense programs, in the 1940s to 1960s and who contracted any of 12 types of cancer known to be associated with materials used in nuclear defense programs.

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Japan Nuclear Fuel Completes Construction Of Rokkasho Enrichment Plant.

Japan Nuclear Fuel (JNF) recently completed the construction of a centrifuge enrichment plant at Rokkasho, at the northern tip of Honshu, Japan's largest island. The plant is scheduled to begin operation in late 1991, at an initial capacity of 150 tons of enriched uranium per year. JNF plans to expand the plant's capacity to 600 tons by 1994. The Japanese government is expected to invest as much as US$1.2 billion in the plant, for research and other projects.

Japanese Vapor Laser Achieves 5% Enrichment

The Japan Atomic Energy Research Institute (JAERI) announced in September that its new experimental vapor laser enrichment test project has achieved a 5% enrichment with an efficiency of 0.004 SWU/kWh, which is only about 10% of the SWU/kWh required for typical gaseous diffusion plants. JAERI stated that the test results confirm the commercial feasibility of the process, and that it expects to later achieve a 65% or better U_{235} recovery rate. JAERI's vapor laser process vaporizes the feed uranium in a vacuum chamber with electron beam guns, ionizes the U_{235} with a dye laser, then recovers the U_{235} electro-magnetically. The Laser Atomic Separation Engineering Research Association is proceeding with a production scale experiment, based on JAERI's test results.

◆ ◆ ◆

US To Cooperate With Hungary and Czechoslovakia On Nuclear Power

US, Hungarian, and Czechoslovakian officials, in a September meeting in Vienna, Austria, agreed to cooperate in the safe and peaceful uses of nuclear power. The agreements, if approved in interagency review and the US Congress, will permit US nuclear equipment vendors to supply substantially more equipment to those countries than was previously allowed.

Soviet Union May Reopen Nuclear Station In Armenia, Despite Earthquake Concerns

A nuclear power station in the Armenian region of the Soviet Union may be reopened to help protect the region against critical electrical shortages this winter. The post-Chernobyl, anti-nuclear reaction in the country has halted or slowed virtually all nuclear power plant construction. Additionally, many nuclear plant workers have left their jobs since the Chernobyl accident, leaving many plants severely understaffed. The Armenian power plant was shutdown earlier in 1990, after the public expressed concern over the potential risk of earthquakes damaging the plant.

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Japan's Kashiwazaki Kariwa–2 Begins Commercial Operation

On September 28, Tokyo Electric Power Company (TEPCO) brought its 13th nuclear power unit, the 1,045 MWe (net) BWR Kashiwazaki Kariwa-2, into commercial operation. Japan's 39th commercial nuclear power unit brings the country's installed nuclear capacity to 30,341 MWe (net). Construction began in October 1983, with Toshiba as the primary equipment contractor.

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TAXATION AND REGULATION OF URANIUM MINING IN CANADA

Government taxation and regulation have a profound influence on mineral operations. In Canada, taxation occurs both on the federal and provincial levels. In addition, both federal and provincial regulations also affect mine operations, sometimes with overlapping, or conflicting, legislation and jurisdiction. Three broad areas of regulation affect the mine production of uranium in Canada: 1) mining law or mineral rights; 2) the licensing procedures; and 3) regulation of occupational health and safety.

TAXATION

Mining in general, and uranium mining in particular, make a substantial contribution to the economy of Canada. This contribution is recognized by the Canadian government, which has been very supportive of the mining industry and has actively encouraged its continued development through direct financial aid, attractive financing, tax credits, and other incentive programs. Provincial governments have generally been supportive, but at times, have adopted restrictive policies that conflicted with federal regulations, and as a result, have inhibited the growth of the uranium mining industry.

Federal taxation of mineral production has its roots in the British North American (BNA) Act of 1867, which retained for the government all of the rights for gold and silver deposits. These rights were later extended to include coal and other minerals. In 1930, mineral rights were ceded to the provinces of Alberta, Manitoba, and Saskatchewan. Each province now owns the Crown mineral rights within its geographical area, with certain exceptions, such as Indian reserve lands and federal parks, where mineral rights are held by the federal government.

In 1946, the federal government passed the Atomic Energy Control Act (AEC). This act defined uranium as a strategic material, and, based upon a clause from the BNA Act of 1867, the federal government claimed control of all use of uranium in the national interests of Canada. The AEC act also established the Atomic Energy Control Board (AECB) to administer the AEC Act, and to regulate all aspects of uranium mining, production, transportation, refining, and end use. Conflicts between federal and provincial jurisdiction arise from the fact that while the provinces own the Crown mineral rights and have jurisdiction over the exploitation of all mineral resources (including uranium), the federal government controls the use of uranium.

Federal Taxation

Federal taxation on Canadian mining companies is limited to a corporate income tax, which makes provisions for: 1) acquisition, exploration, and development expenditures; 2) capital costs, and; 3) a resource allowance for provincial taxation and royalties. The present tax rate applicable to resource companies is 28%, a reduction from the previous rate of 46% (effectively 36% after a provincial abatement of 10%). A federal surtax of 3% on corporate income taxes is scheduled for revision, but has not yet been changed.

Before 1974, provincial mining taxes and royalties were fully deductible for corporate income tax purposes. Since then, those deductions have been disallowed, and resource companies have only been allowed to deduct 25% of specified resource profits as a resource allowance. Interest on development capital is also deductible.

Table 1
PROVINCIAL CORPORATE INCOME TAX RATES

Province	Percent *
Alberta	11
British Columbia	16
Manitoba	17
New Brunswick	15
Newfoundland	16
Nova Scotia	15
Ontario	15.5
Prince Edward Island	10
Quebec	13
Saskatchewan	15
Northwest Territories	10
Yukon	10

* Most provinces have lower rates for smaller firms.

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Provincial Taxation

Provincial governments assess resource corporations by two primary means; income taxes and royalties (also called mining taxes). Income taxes were once uniformly and conveniently set at 10% of corporate income. However many provinces have now departed from that system by implementing their own provincial income tax schedule. **Table 1** lists the provinciai corporate income tax rates that were imposed starting in 1986.

Mining taxes or royalties are the other primary means of provincial income from resource companies. The term "royalty" came into use by most provinces to circumvent a federal government ruling that at one time disallowed the deduction of "mining taxes" on federal tax forms. Although neither mining taxes nor royalties are now deductible, the term royalty is still used when assessing mineral production in all but four provinces. Each province has its own specific mining tax or royalty legislation, often with particular provisions that are unique to the province. For example, Ontario uses a mining tax that contains several provisions such as an automatic depletion allowance (being phased out), an increasing resource allowance (being phased in), special incentives to encourage processing industries to locate in Ontario, and some accelerated depreciation schedules. Quebec permits an investment allowance of 33% of the cost of new processing assets (up to a maximum of one-third of mining profits). Saskatchewan has a "social capital" cost allowance equal to 30% of the declining balance of social capital expenditures, such as residential or community facilities or services. It also allows an additional credit against royalty payments, equal to 35% of any eligible exploration expense, provided that the expense has not already been claimed as production or pre-production costs.

Saskatchewan is the only province that imposes a specific royalty system for uranium. It is comprised of two tiers; first, a flat ad valorem royalty of 5% of gross sales that may be used as a credit against the profit-related royalties. The second tier is a graduated scale of profit-related royalties levied against the profit per kilogram of annual production. This newly-revised system was just announced in July 1990, and is retroactive to July 1, 1989. **Table 2** compares the old and new royalty systems for

Table 2
SASKATCHEWAN URANIUM ROYALTY SYSTEM

Old Royalty System
(introduced 1976, revised 1980)

- 5% royalty on gross sales (up from 3% in 1988). Can be reduced by 1% with a Saskatchewan resource credit.
- Profit-related royalty--increases as return on investment (ROI)increases.

ROI * (percent)	**Royalty in range** (percent of profit)
0–15%	0%
15–25%	15%
25–45%	30%
45+ %	50%

- Once royalty was calculated, an additional credit could be deducted equal to 35% of any eligible exploration expenditure which was not already deducted as a qualifying initial capital investment.

* ROI is calculated as operating profit/capital investment at time of production.

New Royalty System
(retroactive to July 1, 1989)

- 5% royalty on gross sales—regardless of profitability. Used as a credit against profit-related royalty payable.
- Profit-related royalty scale—increases as profit per kilogram increases. Just as old system, royalties are payable at each step and are added progressively to determine the total royalty due.

Profit * (Cdn $ per kg)	**Royalty Due** (percent of profit)
$ 0–2	0%
$ 2–20	15%
$ 20–50	34%
$ 50+	50%

- New system recognizes actual reclamation expenditures among joint venture partners, as opposed to old system which allocated expenditures in strict accordance with percent of ownership of the mineral lease.

* Range limits are annually adjusted for inflation to avoid "bracket creep."

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Table 3
URANIUM ROYALTIES PAID IN SASKATCHEWAN
1976–1988

Year	Uranium Production (thousand lbs U_3O_8)	Royalty Paid		
		(C$ million)	(US$ million)	(US$ per lb)
1988	21,233	19.8	16.1	0.76
1987	21,380	20.3	15.3	0.72
1986	17,943	19.3	13.9	0.77
1985	15,411	33.9	24.8	1.61
1984	15,614	22.3	17.2	1.10
1983	6,109	13.7	11.1	1.82
1982	7,698	28.4	23.0	2.99
1981	7,467	23.8	19.8	2.65
1980	6,242	14.3	8.4	1.35
1979	6,486	12.5	10.8	1.67
1978	6,783	5.4	4.7	0.69
1977	6,226	1.2	1.1	0.18
1976	4,880	1.0	1.0	0.20

Saskatchewan. The new system is regarded as revenue neutral, but is considered fairer and less controversial than its predecessor. This graduated royalty system allows for full recovery of investment plus implicit interest before the graduated royalty becomes payable, and as such, can be considered a significant incentive. The government expects to realize about C$21 million in royalties under the new system this fiscal year. **Table 3** shows the actual royalties paid on uranium production in Saskatchewan for 1976-1988.

MINING LAW

Mining law in Canada includes both federal and provincial regulations, but the provinces have assumed much of the responsibility for regulating mineral development. An overview of some of the regulatory factors affecting mining operations in the Provinces of Ontario and Saskatchewan is shown in **Table 4**.

In order to explore for minerals in Canada, there are often preliminary licensing requirements. Generally a person must obtain a prospectors license to be allowed to look for minerals. Provinces that require this license emphasize that the prospecting license does not convey any interest in land or minerals.

Most provinces will also grant exploration licenses or permits. These grant exclusive rights to explore for minerals in designated areas. The government uses these permits to encourage exploration in certain areas. Permit holders have the right to convert all or a portion of a permit into claims, provided they have complied with the terms and conditions of the regulations.

In areas where permitting is not an option, mineral interests are acquired, initially, by staking a claim. There are distinct differences between provinces, but generally a certain plot of land must be physically "ground staked" and registered promptly with the province. "Map staking" on surveyed land is also done. A claim does not grant the right to remove minerals from the ground (except by permission for testing purposes). Once a claim is recorded and meets all regulatory requirements, the claim holder may then apply for a lease to develop the property and produce from an economically viable deposit. In Saskatchewan, claim holders are guaranteed the right to take their claims to lease provided they have complied with all regulations.

The rights conferred by mineral interests vary depending upon the level of license. Generally, a claim grants the exclusive right to explore, prospect and develop minerals within its area. A lease is required for actual mining operations.

Specific regulations prescribe the physical characteristics of mining interests. In surveyed land, claims are defined in terms of the provincial land survey system; claims lying on unsurveyed land must be ground staked. Legislation also defines the typical dimensions of claims, but allows for some imperfection in ground staking due to the informal nature of ground staking itself. However, specific dimensions and locations must be formalized before a lease is granted; that is, lease boundaries have to be staked or surveyed.

All mining interests have definite time spans of validity. While differences between provinces again are significant, claims typically are valid (assuming other regulations are met) for one or two years initially, with yearly renewals necessary for continuing rights. Leases are generally longer term, ranging from 10 to 21 years, to provide the confidence of tenure to those entering production.

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Table 4
Comparison of Some Ontario and Saskatchewan Mining Regulations and Rights

Regulatory Factors	Ontario	Saskatchewan
Preliminary Licensing Requirements	• Requires prospecting license	• No preliminary license necessary
Exploration	• License of Occupation • License to Prospect	• Exploration Permit—only available in certain areas. Only requires regulatory compliance.
Acquisition of Mineral Rights	• Meet eligibility requirements • Mining Claim —ground staking —record claim within 31 days and pay fee —provide compensation for surface rights, if necessary • Receive Certificate of Record • Lease	• Meet eligibility requirements • Mining Claim —ground staking – unsurveyed land —map staking – surveyed land —record claim within 20 days —pay recording fees • Receive Claim Certificate—a claim guarantees the right to go to a lease • Lease
Rights Conferred by Mineral Interests	• Claim–no rights to material; only right to obtain Certificate of Record • Lease —requires Certificate of Record —provides right to produce minerals, subject to certain reservations and that minerals must be treated and refined in Canada.	• Permit–exclusive right to explore an area, but not to remove material except approved quantities for testing. • Claim–same as permit • Lease–grants exclusive rights to explore, mine, work, produce, and carry away mineral; subject to federal processing restrictions.
Physical Characteristics of Interests	• Claim–unsurveyed – maximum 40 acres; square shape. Irregular shapes allowed with special permission • Claim–surveyed–approximately 40 acres; square shapes as subsections of surveyed plots	• Permit–not less than 10,000 hectares, nor greater than 50,000 hectares; rectangular shape with length less than six times width. • Claim–unsurveyed – not less than 16 hectares nor greater than 6,000 hectares; rectangular • Claim–surveyed – same size limits as unsurveyed, but must include legal subdivisions and coincide with existing boundaries.
Duration and Renewability	• Claim–maximum 5 years, then one additional year to file and pay for lease —deadlines may be extended up to five years in certain circumstances • Lease–valid for 21 years, renewable for 21 year terms	• Exploration Permit–valid for 2 years; may not be renewed • Claim–Initially 2-year term from application date; renewable in one year increments • Lease–valid for 10 years; renewable for 10-year terms

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Table 4 *(continued)*
Comparison of Some Ontario and Saskatchewan Mining Regulations and Rights

Regulatory Factors	Ontario	Saskatchewan
Work Requirements	• Must earn Certificate of Performance by spending certain amounts of money on interest. Formerly was based on number of days worked.	• Permits, Claims, and Leases–holder must spend certain amounts of money on the interest. Permits require a refundable cash deposit. Excess expenditures can be carried forward for future work credits, but only for that dispostion.
Transfer of Interest	• Few restrictions to transfer. Some transfers must be approved by the Minister.	• Transfers subject to strict, but not restrictive, regulations. The main restriction is that the transfer must be unconditional.
Cancellation of Interests	• Interests may be cancelled by if all regulations are not followed, or if interests were obtained illegally.	• Can be cancelled for any breach of terms of interest or failure to meet all regulations.
Acquisition and Compensation for Surface Rights	• Claim–Mineral rights holder has the right to enter and use the portions of area necessary to explore or operate a mine, but has no other claim to surface rights. • Lease–usually includes surface rights, where available. • If holder of surface rights withholds consent to mineral rights holder, Commissioner can become involved and grant disposition as necessary.	• Mineral interests grant no surface rights–must be acquired from government or private owner. • If public land, holders of mineral interests in good standing may apply to the agency responsible for administration of surface rights. (In northern Saskatchewan, it is the Department of Parks.)

In every province or territory, a certain amount of genuine mineral activity is required in order to keep an interest in good standing. Most provinces require a certain minimum dollar amount be spent annually per area of land. Some provinces (for example, Ontario and Nova Scotia) formerly measured work performance by the number of days of work, but they are switching to a dollar expenditure system. This monetary or time level of work needs to be confirmed by certificates of performance or other means of verification. Sometimes payment of deposits in lieu of work performed is acceptable. Additionally, excess work from year to year can sometimes be carried forward, depending on the province, to meet work requirements. Different dollar amounts are required depending on the type of interest (permit, claim, or lease), as well as the length of time the interest has been held. Generally, more time or money must be spent to meet the minimum work requirements, the longer the interest has been held. These minimum requirements usually increase every five to ten years.

To transfer an interest to another party, few restrictions apply. The transfer must be officially recorded, and all rules and regulations must be strictly followed. Some mining interests, depending on the province, can only be transferred with consent of the Minister. Foreign interests in uranium projects are generally restricted to a maximum of 49% by federal policy statements.

The provincial government may cancel the mineral interests of an operator for any number of reasons. Such cancellation is usually due to the failure of the holder of the interest to comply with the legislation governing the conditions of the interest. For instance, any of the

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following could be grounds for cancellation of an interest: expired license; not meeting work requirements; failure to pay appropriate fees or rents; or not filing proper applications or work reports. Fraud, misrepresentation, or bankruptcy can also be grounds for cancellation.

Rights to enter and use the surface of public lands for mineral purposes can be obtained from the applicable government department. If the use of private land is necessary, conflict of interests may occur, and regulations regarding this situation vary from province to province. Some provinces allow access by permission of the owner only, while most others have some form of arbitration legislation to settle any differences. In all cases however, surface rights holders are compensated for any loss or damage sustained.

LICENSING PROCEDURES

Once an operator has staked a claim and acquired the mineral rights, surface rights, and a lease to operate a uranium production facility, the next step is to obtain the federal licenses that pertain to operation.

Federal Requirements

Two federal ministries affect the uranium industry. The Ministry of Energy, Mines, and Resources (EMR) has the responsibility to formulate policies, and the AECB is charged to administer those policies. Thus, federal licensing is done by the AECB. Canada has a joint regulatory process, whereby the federal and provincial governments consult one another before issuing a license. The federal government uses a staged licensing process in which licenses are issued for each phase of the life of a uranium production facility; pre-development, siting and construction, operating, and decommissioning. In the pre-development stage it is necessary to attain a Removal License and an Excavation License. Site and Construction Approval is granted by the AECB after an Environmental Impact Statement (EIS) and a preliminary design for the facility have been submitted and accepted, and reviewed by the public. When a facility prepares for the operating stage, it is required by the AECB to secure a Mining Facility Operating License. This license is normally issued for a two-year term, and only after submission and approval of a detailed safety report, and an updated EIS, as well as reports on anticipated production levels and expected waste quantities. The final stage requires a Decommissioning License to ensure that proper decommissioning plans have been approved, and follow-up monitoring systems are in place. This staged licensing process assures that the facility will conform to current regulations throughout its lifespan.

In addition to the licensing requirements, effective April 1, 1990, the federal government and the AECB instituted new federal licensing fees. Previously, the federal licensing process had levied no charges. These new fees are designed to provide full financing for AECB operations; every facility that is, in any way, regulated by the AECB must pay fees that will fund all AECB operators. This new law uses an established fee schedule for determining the annual payments required. For example, an annual fee of C$84,600 is required for a siting or construction license, and must be paid at the time of application for the license. A uranium facility with a mill and tailings area must pay an annual operating license fee of C$425,000, also payable at the time of application for the license. If use of the license is completed before the end of its term, the balance of the fee will be refunded on a pro-rata basis.

One other key federal regulation pertains to foreign ownership in the uranium mining sector. The EMR has issued policy statements that limit foreign ownership interests to a maximum of 49%, with exception granted to allow greater percentages of foreign ownership if it can be clearly established that the project is Canadian-controlled. However, a potential pitfall exists in the foreign ownership regulations. The AECB, which regulates the industry, does not recognize, and therefore does not enforce, these EMR policy statements. Thus, the AECB could approve the entire licensing process of a project without even referencing foreign ownership. Yet, the EMR policy statements are regarded as official legal policy by the Canadian federal court system, and thus the policy statements must be followed as law, even if the AECB does not enforce them.

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Provincial Requirements

Using Saskatchewan as an example for provincial regulations, if a new mining operation or expansion of an existing facility is proposed, the operator must receive permission from the Minister of Environment and Public Safety (EPS). In order to receive approval from the EPS Minister, an EIS must be submitted. This very comprehensive study is in final form when submitted to the Minister. The EIS must also be open for public review—this review process is to provide input to aid the Minister in making his approval decision. During the review process, the Minister has the option of appointing a Public Board of Inquiry for further review. The two most recently-developed uranium mines in Saskatchewan both went to Boards of Inquiry. The operator must next ensure that it has signed a surface lease with the Province of Saskatchewan before proceeding with any construction. The surface lease can be issued prior to completion of the EIS review.

The Mines Pollution Control Branch of the EPS utilizes two main types of documentation to enforce Saskatchewan environmental regulations: Construction Approvals and Permits to Operate. Construction approvals are necessary for building any waste handling or treatment facility, and require specialized review before being authorized. Permits to Operate are only valid for one year at a time, and require a thorough and detailed review of environmental compliance before being renewed. Typically, the licenses will contain operating requirements common to the industry as a whole, as well as specific regulations pertaining to that particular facility. These very comprehensive licenses are the basis for Saskatchewan's regulatory program.

In addition to operating regulations, the licenses also require operators to have quality assurance programs to ensure that the data and reports being filed are accurate and represent the actual conditions at the mine or mill. The Saskatchewan Ministry of Environment and Public Safety also requires any new proposals to include a conceptual decommissioning plan in the EIS. Proponents then must submit a detailed decommissioning plan before undertaking any decommissioning and reclamation work.

OCCUPATIONAL HEALTH AND SAFETY

Background

Before 1978, the Atomic Energy Control Board (AECB), had no jurisdiction over health and safety matters relating to the uranium mining industry. Each province was responsible for the safety of its mines and the health of the mines' workers. In 1974, in response to criticism by an opposing political party and to labor problems, the Ontario government established the Ham Commission to examine occupational health and safety in uranium production. The Ham Commission released its recommendations in 1978. Later that year, the government adopted the commission's recommendation that the AECB should be responsible for regulation of the entire nuclear fuel cycle.

Ontario

Although regulation of the radiological aspects of mine safety and the workers' health, and the authority to issue overall operational approvals, were vested in the AECB after 1978, Ontario maintains a strong regulatory influence. Ontario's radiological health and safety regulations for uranium mining were adopted by the AECB for its regulation of Ontario mining. Ontario's inspectors regulate conventional health and safety aspects of the mines and workers. Ontario is then paid by the AECB to enforce the radiological regulations and supply the inspectors, who are given AECB authority to enforce what were Ontario's laws, and are now Canadian laws applicable to Ontario. Some of the health and safety areas that are regulated and inspected are, for example, silica dust limits, gamma radiation exposure and personal radon daughter dosage.

Saskatchewan

In contrast, the Saskatchewan government took an active role in establishing concurrent jurisdiction. For example, to avoid conflict with the federal government's health and safety regulations, the Saskatchewan government passed occupational health and safety regulations that must be met in order to be granted a surface lease (leases can only be granted by the provinces). Therefore, if an operator fails to comply with the stricter provincial standards, the lessee can be sued for breach of contract and the lease revoked if the lessee is found guilty. The province has no other means to enforce its stricter standards

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Because the province is limited to this form of enforcement and the private sector must contend with dual regulation, the AECB and Saskatchewan government have been working to improve the regulations and enforcement procedures. The agreements have all been worked out and are now awaiting legislative approval at both the provincial and national levels. If the legislative approval is received, Saskatchewan will be much like Ontario, in that all authority to regulate radiological health and safety standards will be ceded to the control of the AECB. The AECB will adopt Saskatchewan's radiological health and safety standards, and then pay Saskatchewan to provide the enforcement of the radiological standards, which will apply only to uranium mining in the Saskatchewan province. ■

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PRIBRAM URANIUM DISTRICT

Overview

Pribram is one of the largest and richest vein uranium districts in the world. The Pribram district has accounted for about 60 percent of Czechoslovakia's total uranium production. The Pribram uranium district is located about 60 kilometers southwest of Prague, in Czechoslovakia's central Bohemia region. This district contains perigranitic, monometallic, vein-type uranium deposits. The deposits are within a northeast-southwest elongated area, about 20 kilometers long and 1-2 kilometers wide, located between Oboriste in the northeast and Tresko in the southwest. Several thousand veins have been discovered; about 1,600 have been mined. Most of the veins are grouped in clusters, which are intense accumulations of veins paralleling or intersecting each other within a narrow segment.

In total, about 155 million metric tons of ore and waste have been mined, 85 million tons of which has been hoisted to surface; the remainder was used underground as backfill. Production to date has yielded approximately 65,000 metric tons equivalent U_3O_8. The estimated average grade for ore mined is about 0.75% U_3O_8. Pribram, as with all other uranium mines in Czechoslovakia, is owned and operated by Ceskoslovensky Uranovy Prumsyl (CSUP).

Exploration first started in 1947, in the lead, zinc, and silver mines that are located about 3-4 kilometers northwest of the main uranium zone. These multimetallic veins contain some uranium in the upper levels. Uranium mining began in 1950. Production peaked at about 1,900 MTU per year between 1960 and 1970. By 1976, production had dropped to 900 MTU per year, and has now fallen to 500-600 MTU per year. The Pribram district's reserves are almost depleted, and production is expected to cease in 1991 or 1992.

Until this year, all uranium production was exported to the USSR, with only the amount required for Czechoslovakia's nuclear power stations being returned (as fabricated fuel). Most of Czechoslovakia's present and future uranium production will come from sandstone deposits in the North Bohemian Cretaceous Basin, such as Hamr and Straz.

Geology

Host rocks are dominantly Upper Proterozoic schists (Spilite and Post-Spilite Series), and locally-Cambrian clastic sediments which are slightly regionally-metamorphosed and contact-metamorphosed. Pribram's sediments have been folded into a 25 kilometer-long asymmetric anticline, and a westerly adjacent syncline.

An abundance and variety of dikes, sills, apophyses and stocks intrude the sequences. Dikes are 0.5 meter to 15 meters wide, and can persist for as much as 1,000 meters, both laterally and vertically.

The most important intrusion is the hetergenous granitic Central Bohemian Pluton, which forms the southeastern boundary of the district. At this contact, the pluton flank is northwesterly overturned to a depth exceeding 2,000 meters (**Figure 1**).

The district is at the junction of the NE-SW trending Central Bohemian Lineament, and the NW-SE oriented Jachymov Lineament. This position resulted in a complex fault pattern (**Figure 2**). Local faults of various directions are abundant, extending from tens of meters to a few kilometers, and undergoing repeated reactivation. Displacements are commonly less than 30 meters. Three types of faults are distinguished: unmineralized, mineralized (containing uraniferous veins), and dike structures.

Wall rocks are modified by a variety of alterations. Most prominent are sericitization, illitization, chloritization, carbonatization, and hematitization. Alteration aureoles in sediments commonly persist for 0.1 to 3.0 meters from veins, but are more extensive in intrusive rocks. In segments of multiple veins, alteration may spread over intervals tens of meters in width.

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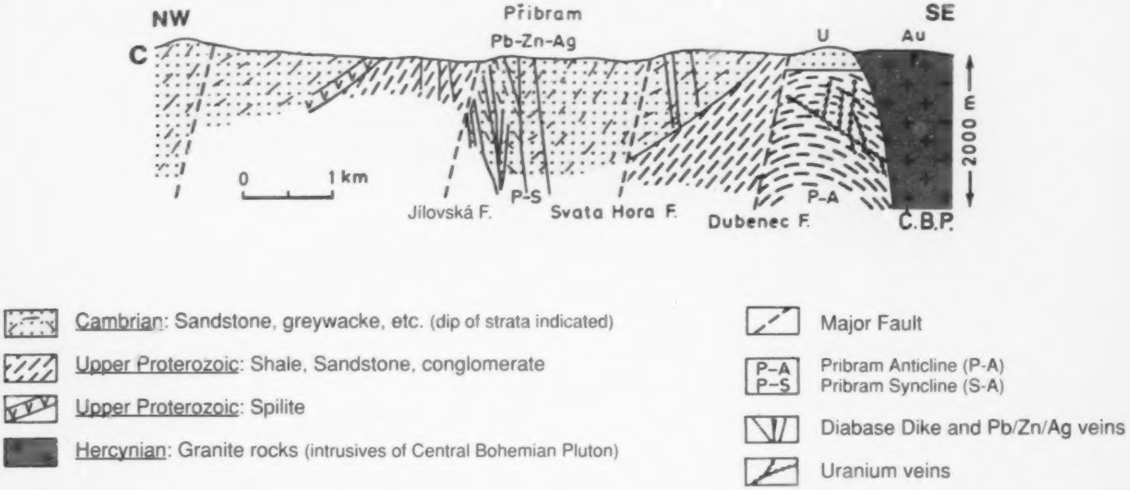
NW
C
Přibram
Pb-Zn-Ag
U
Au
SE
2000 m
0
1 km
Jílovská F.
P-S
Svata Hora F.
Dubenec F.
P-A
C.B.P.
Cambrian: Sandstone, greywacke, etc. (dip of strata indicated)
Upper Proterozoic: Shale, Sandstone, conglomerate
Upper Proterozoic: Spilite
Hercynian: Granite rocks (intrusives of Central Bohemian Pluton)
Major Fault
P-A
P-S
Pribram Anticline (P-A)
Pribram Syncline (S-A)
Diabase Dike and Pb/Zn/Ag veins
Uranium veins

Figure 1 — Pribram Uranium District. NW-SE section across the regional structural grain. The diagram illustrates in a schematic mode the location of Pb, Zn, Ag, U, and Au veins with respect to the overhanging pluton contact. Structures of the Central Bohemian Lineament trend NE-SW; those of the Jachymov Lineament trend NW-SE.

Mineralization

The principal uranium mineral is pitchblende. Coffinite and uraniferous anthraxolite occur in small amounts. Sulfides, mainly lead, zinc, and iron, are present, but in minor quantities. Calcite is the dominant gangue mineral. In total, more than 50 minerals, including 35 ore minerals, have been identified in the Pribram uranium ore. They form four principal mineral stages: Siderite-sulfide, early calcite, calcite-pitchblende, and calcite-sulfide.

Four types of vein infillings, based on the quantitative presence of the respective mineral assemblages, are recognized:

- *siderite-sulfide veins* containing 60-90 volume-percent (v/o) of the stage one siderite-sulfide assemblage;
- *calcite-pitchblende veins* containing 90 v/o of minerals of stages two to four;
- *calcite veins* containing 100 v/o of minerals of the stage four calcite-sulfide assemblage;
- *mixed veins* containing minerals of all stages.

Three types of recoverable ores can be identified based on the predominance of distinct ore minerals:

- pitchblende ore;
- uraniferous anthraxolite ore;
- sphalerite-galena-silver ore.

The uranium minerals display a distinct zoning. Intrinsic and extrinsic veins near the intrusive contact contain only pitchblende. Veins farther from the contact also contain anthraxolite, which increases in amount as the distance from the contact increases. The amount and relative fraction of anthraxolite increases laterally, from the margins of the district to the center of the district, where the major vein clusters developed, and where the veins have the greatest depth persistance. The relatively large quantity of anthraxolite in vein clusters combined with the presence of methane and hydrocarbons, suggests a genetic relationship between the organic material and fracturing. A source of the organics may be the carbonaceous/graphitic constituents of the Spilite Series underlying the deposit.

Mineralized veins can be separated into three groups based on their dimensions:

- Large veins that extend laterally and vertically for 500-1,000 meters and more (some veins persist to a

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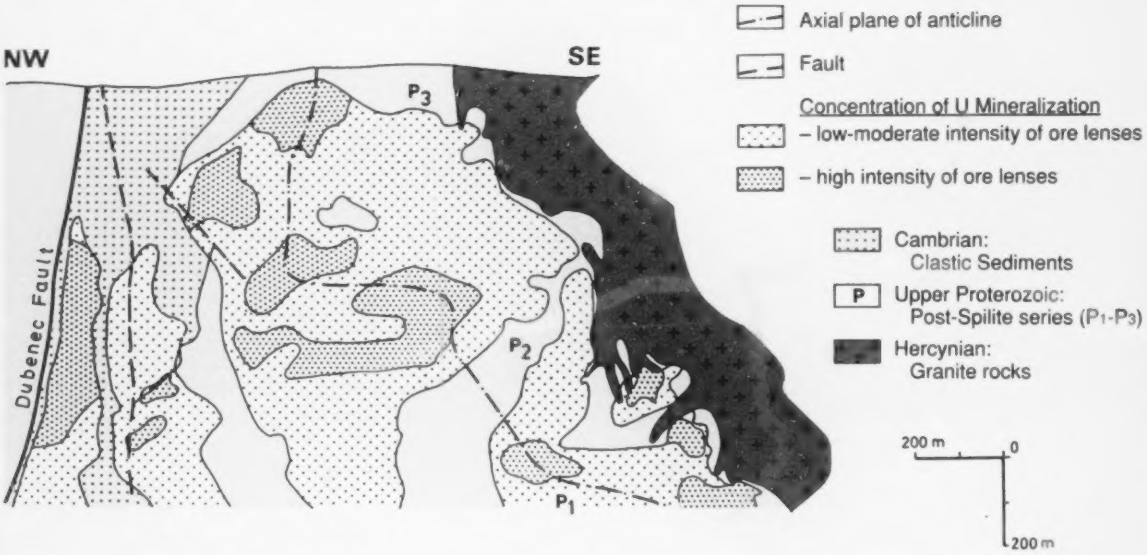
NW
SE
Dubenec Fault
P3
P2
P1
Axial plane of anticline
Fault
Concentration of U Mineralization
– low-moderate intensity of ore lenses
– high intensity of ore lenses
Cambrian: Clastic Sediments
P Upper Proterozoic: Post-Spilite series (P1-P3)
Hercynian: Granite rocks
200 m
0
200 m

Figure 2 — Pribram Uranium District. Vertical projection of a NW-SE oriented U vein.

depth of more than 2,000 meters) at a thickness of 5-100 centimeters. In extreme cases, some veins can be up to 12 meters thick. The large veins constitute the principal structures of vein clusters and account for approximately 5% of all veins in the district.

- Medium veins extending 100-500 meters with thicknesses of 1-50 centimeters. These veins commonly occur as subsidiary veins to the large veins and account for 45% of all veins.
- Small veins extend up to 100 meters and are less than 50 centimeters wide. They occur subsidiary to the larger veins and constitute 50% of all veins.

Mineralization forms tabular to lensoid bodies emplaced in one or several branches of structures. These pay streak lodes are of complex geometry, and are composed of gangue with pitchblende, anthraxolite, coffinite in the form of stringers, coatings, botryoidal aggregates, and pods. The pay streaks range in size from a few millimeters to tens of centimeters thick, and extend laterally and vertically from one to several hundred meters. Most veins contain only one uranium-mineralized lense, but larger and more extensive veins may host up to 15 individual lodes.

The lodes have irregular boundaries and alternate with non-uranium veinstuff. Together, they form bodies with dimensions of about 1,000 to 100,000 square meters. The pay streak part of the vein may constitute 1-50% of the total vein infill, which corresponds to a coefficient of mineralization (Kr: the ratio of mineralized plane to total plane of a vein) ranging from 0.01 to 0.5. Approximately 60 percent of the ore bodies have a Kr that is between 0.04 and 0.16. Kr values above 0.3 are only found in small ore bodies.

Although economically-recoverable mineralization occurs in an area about 20 kilometers long, the bulk of the ore (50-60% of the total reserve of the district) is concentrated in a 3-4 kilometer-long zone in the Bytiz sector. One vein system in this sector, Bt-4, yielded 10,000 to 15,000 metric tons U_3O_8. The upper limits of the veins of this sector are in the southwestern section

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(near shaft 16), about 100 meters below the surface, and in the northeast, about 300 meters below the surface (near shaft 19). The veins persist to a depth of 2,000 meters or more.

Lithology imposed a twofold control on the deposit; physical-mechanical properties influenced the location and development of structures, and chemical composition affected the chemistry of mineralizing fluids. Correspondingly, uranium distribution displays the following lithologic controls:

- 97% of the uranium mineralization is emplaced within the Post-Spilite Series, whereas Cambrian sediments, tuffites of the Spilite Series, and granites, contain only 3% of the lodes.
- The richest intervals developed where host rocks reacted to tectonic stress by more brittle deformation and wider cataclastic extension, thereby providing adequate permeability, and allowing the rocks to best react with the mineralizing fluids.

The uranium is postulated to have originated from sediments, with subsequent enrichment during magma differentiation. Leaching of uranium from the granitic rocks occurred by fluids migrating along NW-SE oriented faults. Isotope studies suggest that a certain supply of uranium may have been derived from residual magmatic solutions. Contact-metamorphism may also have mobilized uranium within the metasediments.

A direct relationship between ore formation and granite intrusion is disputed. Uranium/Lead datings of pitchblende I yield ages of 265(±15) million years. Therefore, pitchblende crystallization occurred approximately 20 million years after the consolidation of the last intrusive phase of the Central Bohemian Pluton. As such, the situation in the Pribram district displays a similar time gap between magmatic intrusion and pitchblende formation, just like most other granite-related vein uranium deposits within the late Paleozoic Hercynian orogenic belt in Europe.

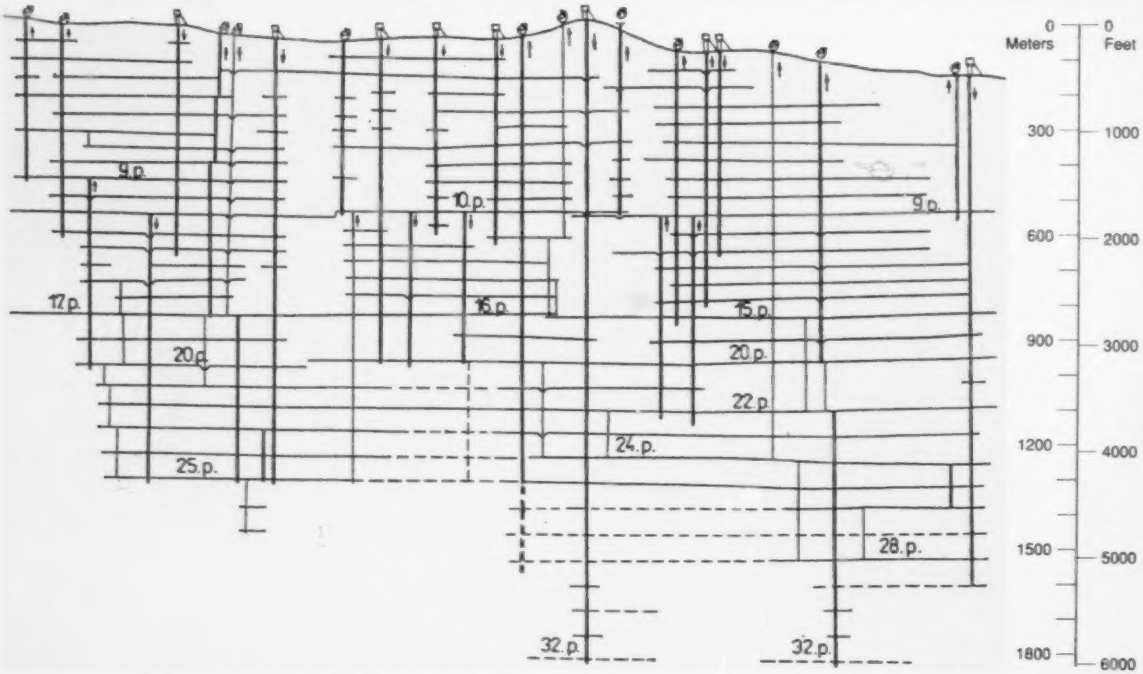

Figure 3 — Pribram Uranium District. SE-NW section along central part of the district. Diagram shows the development scheme of shafts, blind shafts, and drifts. Levels are 50-60 meters apart. The deepest level is level 32, 1,836 meters (6,024 feet) below the surface. Arrows indicate ventilation direction in shafts.

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Mining

The Pribram mine is an underground mine with 32 levels and 68 shafts, including internal shafts. The deepest shaft is 1,836 meters (6,024 feet) deep (**Figure 3**). Temperatures at this depth reach 45C (113°F). The mine's cooling system lowers the working temperatures to about 25-30C (77-86°F).

Haulage levels have a vertical separation of 50-60 meters. Extraction blocks (stoping segments) are 50-60 meters high and 50 meters long (total face is approximately 2,500 square meters). Mining width averages 1.0-1.2 meters (0.8 meters is the minimum width). Extraction is by overhand stoping from sublevels with 5 meters of vertical separation. Ore is selectively recovered from the veins. Waste is blasted first, removed or used as backfill, then the ore is blasted and separately recovered. Veins containing large ore lenses are mined in such a way that unmineralized vein sections remain as pillars. Material containing subgrade uranium contents are partly heap-leached underground. Alkaline ISL was tested at Bt-4 and Bt-5 on the 20th level, but did not prove very successful.

Run-of-mine ore is preconcentrated by radiometric and gravimetric sorting to about 2% U, using a cut-off grade of 0.01-0.02% U. Waste and subgrade fractions are selectively stockpiled. Better grade material is heap-leached on site. Presently, 1,300 metric tons of ore is produced per day. The concentrate is shipped 90 kilometers, by rail, to the central mill at Mydlovary, north of Budejovice. The mill, which was constructed during the period 1959-1963 and expanded in 1970, has a capacity of 700,000 metric tons per year. ■

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URANIUM EXPLORATION AND DEVELOPMENT UPDATE

The August 1990 NUEXCO Monthly Report #264 characterized exploration activity in the US as being in a "survival" mode. Exploration activity in Canada is also at very low levels, but even so, a new, world-class deposit has been discovered. During 1990, work continued on a number of important projects, while several major mines cutback production, or closed down altogether.

Canada is still the largest uranium producing and exporting country in the world, despite the limited amount of recent exploration. Most exploration activity has been focused within areas favorable for the occurrence of deposits linked to Proterozoic uncomformities, most prominently in northern Saskatchewan's Athabasca Basin.

CURRENT ACTIVITY IN CANADA

Cameco is the predominant operator in Canadian exploration and development projects. At the Cigar Lake deposit, Cameco (operator for, and 48.75% owner of, the Cigar Lake Mining Corporation) announced in August that it had completed excavation of a 500-meter shaft and was continuing with the test mining program. Shaft furnishings are to be completed by the end of 1990, with mining tests from lateral development of three drifts, each 120-150 meters long, beginning in 1991.

However, Cameco's most important announcement concerned the McArthur River P2 North deposit, a little over 40 miles northeast of Cameco's Key Lake mine. Cameco is the operator for the McArthur River Joint Venture which is owned by Cameco (44.0%), Uranerz Exploration and Mining Ltd. (29.4%), AGIP Resources Ltd. (10%), Interuranium Canada Ltd. (9.1%), Cogema Canada Ltd. (6.5%), and Imperial Metals Corp. (1.0%). On May 30, Cameco announced the discovery of a deposit expected to contain in excess of 100 million pounds equivalent U_3O_8. Initial testing placed the average ore grade at 3%. However, Cameco announced this month that these figures have been revised significantly upward to a grade of approximately 4% on reserves of about 200 million pounds. On this basis, the McArthur River discovery ranks among the top two or three uranium deposits in the world.

Cogema Canada Ltd. will resume drilling activity in Saskatchewan in November. Two-thirds of the drilling in northern countries of the world is done in the dead of winter, as all bogs, rivers, and so on, are frozen over and therefore easier to traverse. In April, Cogema Canada had completed a drilling project with two rigs at the Henday Lake Project.

Denison Mines Ltd. announced, in April, that the underground test mining program at its Midwest Project had been completed and that the results of a feasibility study would be released by the end of 1990. The test mining program included the sinking of a 185-meter shaft in 1989, and the subsequent drilling of two 4-foot diameter bore holes, through the ore body, from an underground drill station that was just above the ore zone. The Midwest project is located in the eastern part of the Athabasca Basin, just 15 miles from Cameco's Rabbit Lake project. Denison has stated that the project has total resources of 56 million pounds equivalent U_3O_8 at an average grade of 1.25% U_3O_8. The proposed production rate is 3.6 million pounds equivalent U_3O_8 per year.

Interuranium Canada Ltd. reports no drilling activity in the Athabasca Basin. However, at a location that Interuranium Canada did not disclose, one drill rig has been active for the past several months.

Minatco Ltd. is planning ongoing exploration and feasibility studies at its Wolly project, which includes the McClean Lake site. This site is on the eastern side of the Athabasca Basin, west of Wollaston Lake. Minatco announced early this year that it had discovered ore grade mineralization at shallow depths in the McClean Lake area. This discovery is in addition to the previously known resources of the area, which total some 18.7 million pounds equivalent U_3O_8 at an average grade in excess of 1.5% U_3O_8.

PNC Exploration (USA) Inc. reported the completion, in March 1990, of a time/domain/electro-magnetic geophysical survey in the eastern part of the Athabasca Basin.

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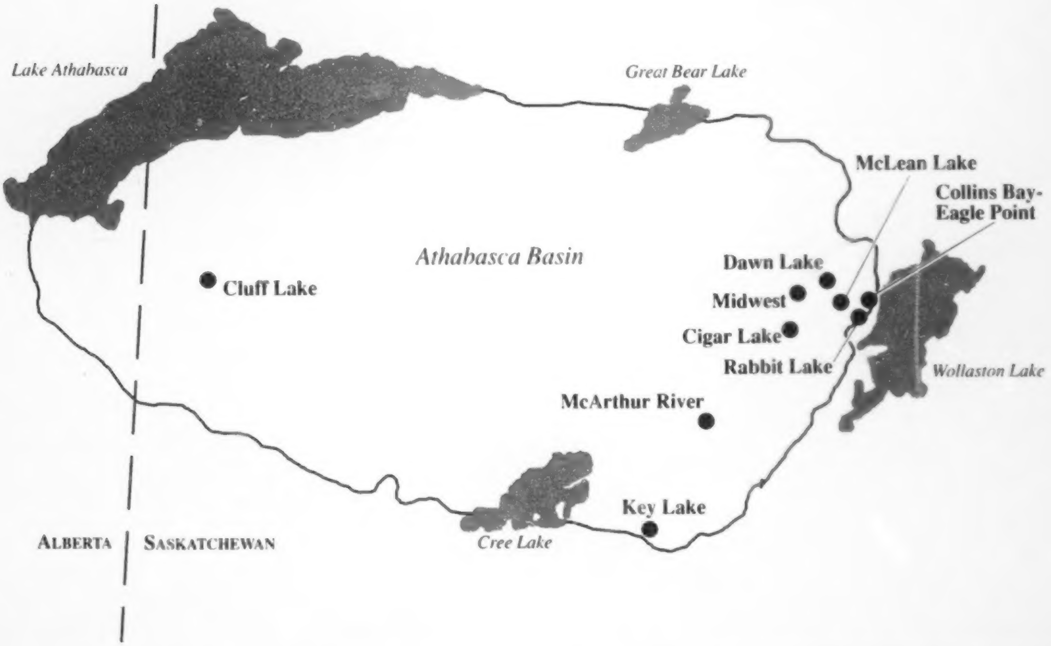
Figure 1
Major Exploration & Development Projects, and Mines, of the Athabasca Basin



Urangesellschaft (UG) had one drill rig operating during the summer at the Sisson Schultz South project. UG is the operator; PNC Exploration (USA) Inc. and Daewoo Corp. of Korea are partners in the project. The project is about 100 miles north of Baker Lake and near Kiggavik, in the Keewatin area of the Northwest Territories. This area is within the Thelon Basin, which is very similar, geologically, to the Athabasca Basin of northern Saskatchewan. During the short summer season for exploration, about 20,000 feet of drilling was planned. The rate of progress was 200-300 feet per day on 500-1000 foot holes.

UG, as also the operator for the Kiggavik project (UG–79%, CEGB Exploration Canada–20%, and Daewoo Corp. of Korea–1%), which is now in the mine-planning stage. Initial plans call for two open pit mines, which would operate over an 11-year period to produce a total of 45 million pounds equivalent U_3O_8. However, UG recently put the proposed C$150-$175 million development of the mine on hold because of two issues.

The first is that the Federal Environmental Review Office (FEARO) has requested substantially more information than UG initially submitted. UG has requested an indefinite delay of FEARO's environmental hearings, in order to perform the appropriate research and field work, and prepare thorough documentation. UG must also submit all new documentation to the FEARO panel "in layperson's language," written both in English and in Inuktitut (the language of the Inuit natives).

The second issue is an agreement-in-principle between the federal government, the government of the Northwest Territories, and the Tungavik Federation of Nunavut regarding the Inuit land claim. The mining development provisions of the agreement are not yet clear, and UG wants to assess the potential impact of the agreement on the Kiggavik project.

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CANADIAN REGULATORY ATMOSPHERE

The entire Canadian uranium industry is concerned about recent changes in the regulatory environment. The latest federal budget for the regulatory agencies has nearly doubled. Also, Saskatchewan's government has approved a 40% increase in the regulatory budget, and provided funding for over one-third more staff. René Lévesque, board president of the Canadian Atomic Energy Control Board (AECB), confirmed the government's hard-line position when he stated, "We will take drastic health, safety and environmental protection measures, including shutting down nuclear facilities and prosecuting their operators, to guarantee that they fulfill every detail of their licenses."

These were not hollow declarations, for on May 18, the AECB suspended the license of Cameco's Blind River uranium refinery for one week, because of the May 16-17 release of an excessive amount of uranium dust. In other legal actions, and the first ever against mine operators, Cameco was fined C$10,000 for a waste water spill at the Rabbit Lake mill, and Rio Algom was fined C$3,000 for excessively alkaline discharges from the Elliot Lake site.

The AECB board wants to put more impact into its regulatory actions by substantially increasing the penalties it can wield. However, such changes in penalties will require legislative reforms before the increased penalties can be implemented.

The uranium industry is concerned that these regulatory changes, and the many more that are likely to follow, will further limit the industry's ability to profitably mine uranium, especially in an already weak market. New projects may not be mined, or even explored, and existing facilities may close, if restrictions become too extensive and expensive.

CANADIAN PRODUCER RESPONSES TO THE WEAK URANIUM MARKET

The weak worldwide market for uranium is already taking its measure of Canadian producers. In March, Denison cut back production at Elliot Lake by 37%, and in August, Rio Algom closed both its Quirke and Panel mines. All three of those mines had production costs approaching US$30 per pound U_3O_8. Companies with deposits that can be mined at profitable costs will be the likely suppliers in the near future. The focal question then becomes, what will these production costs actually be. It is possible that what could have been mined profitably a year or two ago, may no longer be profitable as a result of new regulatory requirements.

Much as in other parts of the world, Canadian producers are turning to acquisitions instead of exploration in order to maintain their reserve positions. Another trend of interest is the redirection of uranium exploration programs to gold exploration, as the gold market is healthier. This measure also has effect of reducing expenditures on grass-roots uranium exploration.

CURRENT US ACTIVITIES

Recent US exploration and development activity has also been at very low levels, with the notable exceptions of two in-situ leaching (ISL) projects. The two are Uranium Resources, Inc.'s (URI) Rosita project in the South Texas district, and Ferret Exploration Company of Nebraska's (FEN) Crow Butte project, in Nebraska.

URI's Rosita project began operation on September 4, at a rate of 0.8-1.0 million pounds equivalent U_3O_8 per year. Production is from shallow depths within the Goliad Formation, and is one of the lowest-cost production sites in the US, at less than $10 per pound U_3O_8.

FEN's Crow Butte project has kept three drills going all summer. The initial well field is nearly completed and plant erection is finished. Piping and electrical work are continuing, and production is expected to begin in early 1991. The mine's production costs should also be low. This new mine is in a new district that has not had any prior uranium production: the mine will exploit a major uranium occurrence in the Chadron Formation.

US exploration activity remains essentially confined to the Arizona Strip, where Energy Fuels Nuclear, Union Pacific Resources, and Pathfinder Mines have active projects. Power Resources has kept three drill rigs busy at its Highland Ranch Project in the South Powder River Basin of Wyoming, maintaining the project's production capability of 1.0 million pounds equivalent U_3O_8 per year.

Tom Pool
Bob Steele

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NUCLEAR INDUSTRY CALENDAR

1990

Nov. 11-14	***Nuclear Energy Forum*** (Washington Hilton, Washington, DC). Sponsored by the USCEA and the American Nuclear Society. Contact: USCEA Conference Office; 202-293-0770: or ANS Meetings Department; 312-352-6611.
Nov. 12-16	***First Regional Seminar for Europe and the Middle East on Quality Management for Nuclear Power Projects*** (Prague, Czechoslovakia). Sponsored by the IAEA. Contact: Conference Service Section, IAEA, P.O. Box 100, A-1400 Vienna, Austria.
Nov. 12-13	***Fourth World Electricity Conference*** (London, England). Sponsored by The Financial Times Ltd. Contact: Financial Times Conference Organization; 71-925-2323, Telex: 27347, Fax: 71-925-2125.

1991

Jan. 13-16	***Nuclear Insurance Conference*** (The Peabody Orlando Hotel, Orlando, Florida). Sponsored by the USCEA. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Feb. 3-6	***Nuclear Marketing: Utility Needs in the 1990s*** (Clearwater, Florida). Sponsored by the American Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
March 24-27	***Fuel Cycle Conference '91*** (Sheraton Scottsdale Hotel, Phoenix, Arizona). Sponsored by the USCEA. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
April 8-10	***Japan Atomic Industrial Forum Annual Conference*** (Tokyo, Japan). Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.
April 14-17	***INFO '91 Conference*** (The Westin Hotel, Chicago, Illinois). Sponsored by the USCEA. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
April 14-18	***Third International Conference on Nuclear Fuel Reprocessing & Waste Management*** (Sendai, Japan). Sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, co-sponsored by the American Nuclear Society and the European Nuclear Society. Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.
April 22-25	***JAIF International Conference on Water Chemistry in Nuclear Power Plants*** (Fukui, Japan). Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

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CALENDAR

1991

May 12-14	***World Nuclear Fuel Market Annual Meeting*** (Atlanta, Georgia). Contact: Donna Cason, World Nuclear Fuel Market; 404-447-1144.
May 13-15	***Second International Conference on Transportation for the Nuclear Industry*** (Bournemouth, England). Contact: Conference Secretary, The Institution of Nuclear Engineers; 081-698 1500.
May 14-16	***Annual Meeting on Nuclear Technology '91*** (Hotel & Congress Center Maritim, Bonn, Germany). Sponsored by the Kerntechnische Gesellschaft e.V. and the Deutsches Atomforum e.V. Contact: INFORUM GmbH, Congress Office JK'91, Heussallee 10, D-5300 Bonn 1, or 0228/507 223.
June 2-6	***American Nuclear Society Annual Meeting*** (Marriot Orlando World Center, Orlando, Florida). Contact: ANS Meetings Department; 708-352-6611.
June 23-26	***International Conference on Enrichment*** (The Westin Hotel, Washington, DC). Sponsored by the USCEA. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the USCEA. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the USCEA. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.

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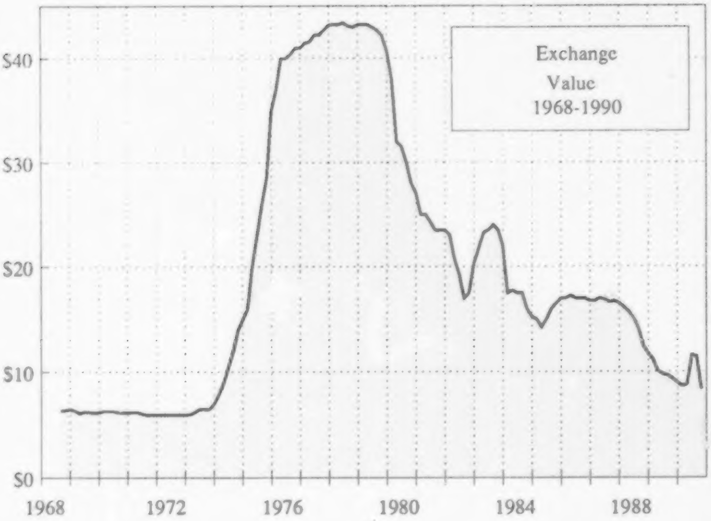
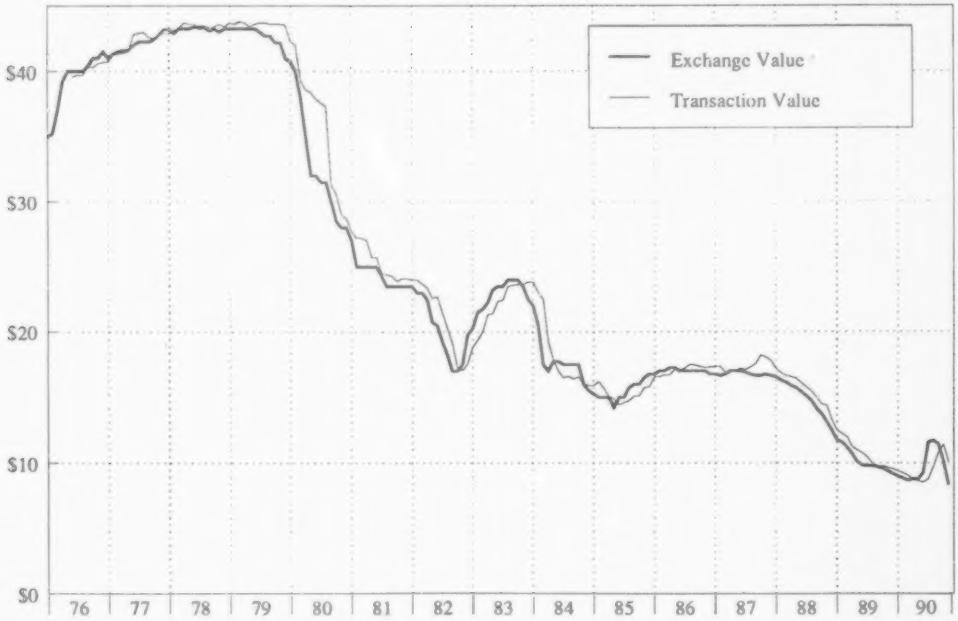
NUEXCO Historical Exchange Value and Transaction Value

(In US Dollars per Pound Equivalent U_3O_8)





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NUEXCO

HISTORICAL MARKET DATA

HISTORICAL MARKET VALUES

EXCHANGE VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	[illegible]	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	**8.35**		

US PREMIUM (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF6 VALUES

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	[illegible]	32.50	32.25	29.50	**24.75**		

US UF6 PREMIUM (Relative to the UF6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

TRANSACTION VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	**10.10**		

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HISTORICAL MARKET DATA

LOAN RATES

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**		

* Float with Prime Rate

CONVERSION VALUES

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	**1.45**		

SWU VALUES

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	**51**		

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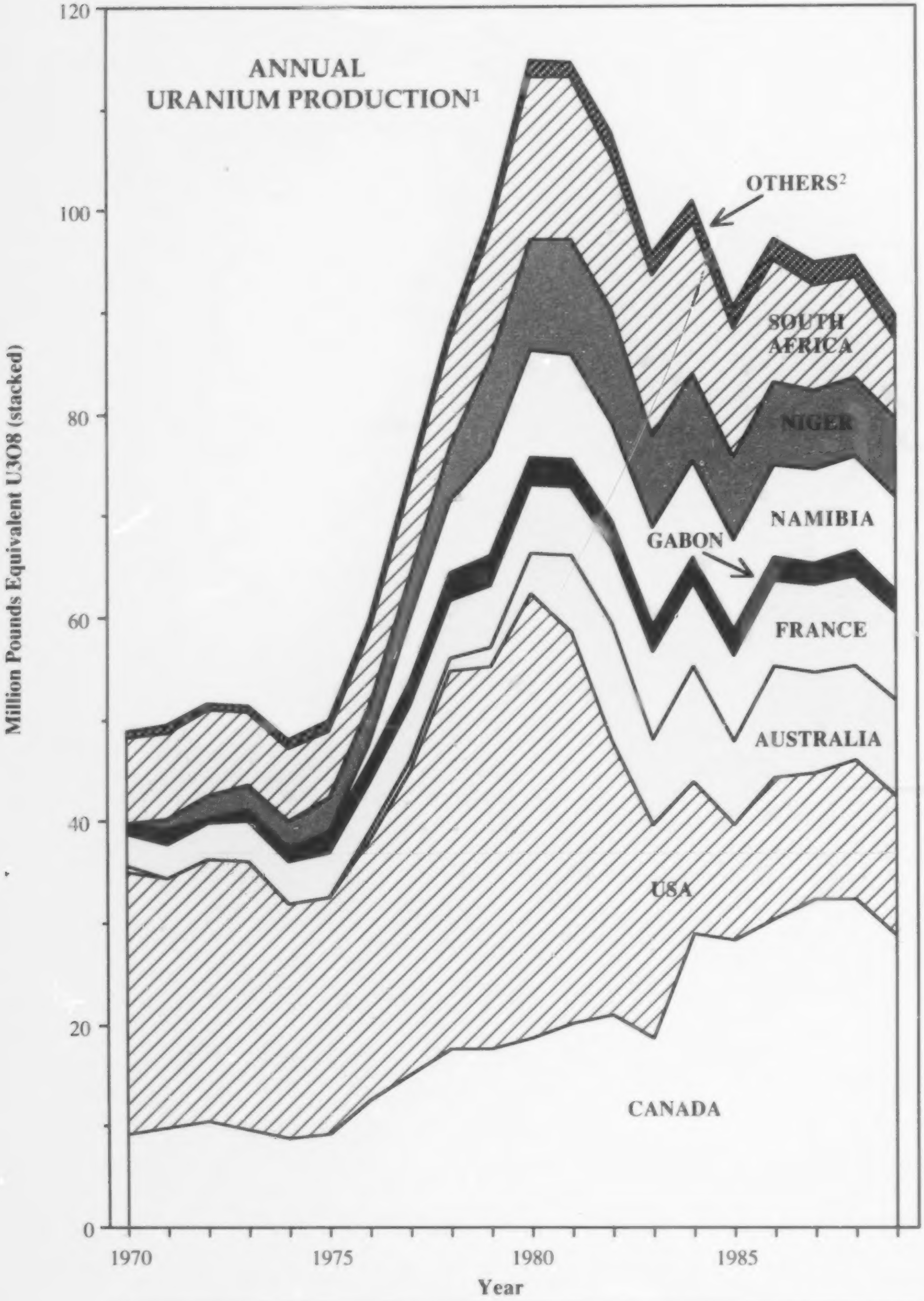

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Others** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, West Germany and Yugoslavia

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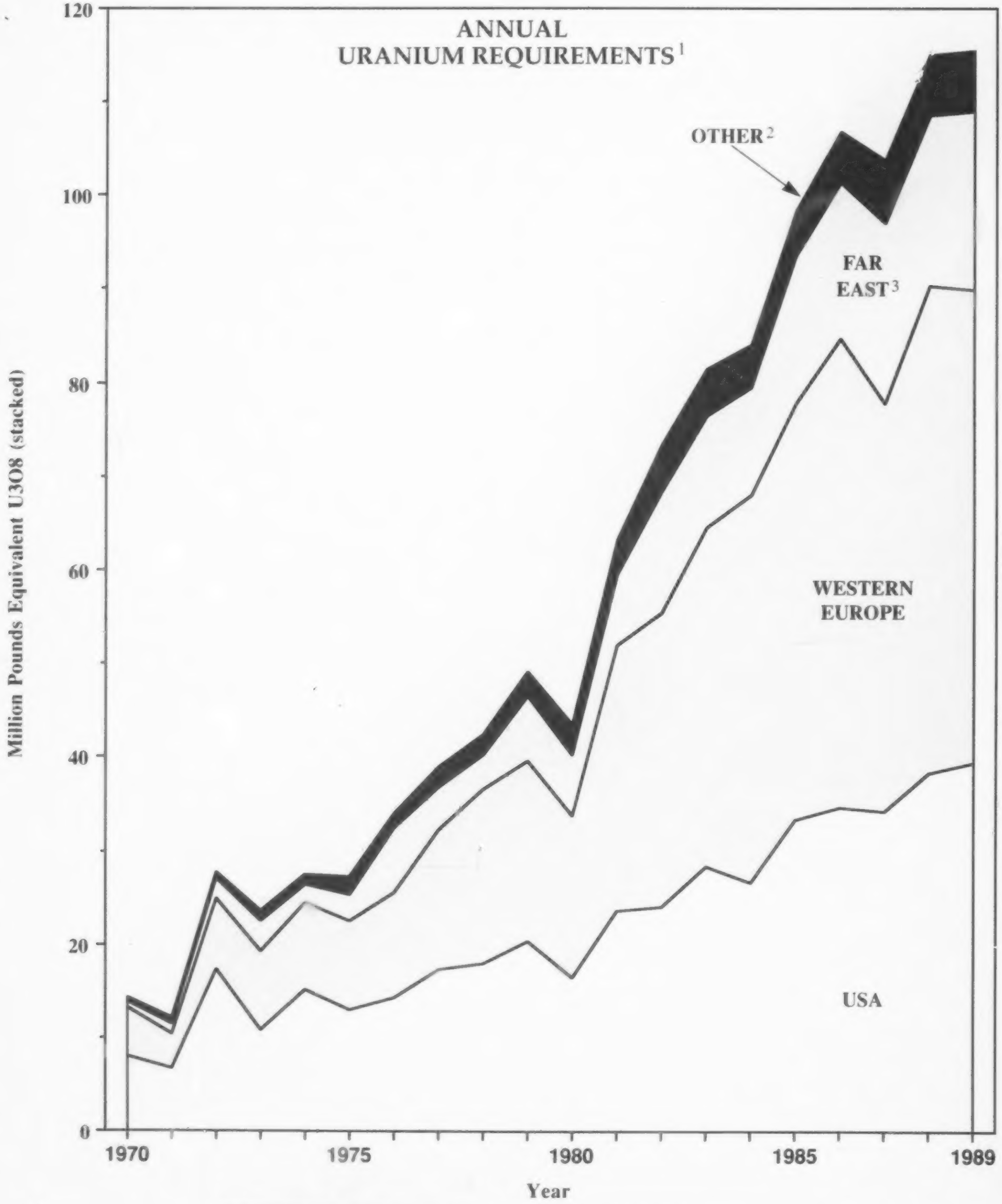
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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AUSTRALIA

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
Jan	1990	—	119.2	—	128.0
Feb	1990	—	120.8	—	128.0
Mar	1990	204.1	121.5	—	128.2
Apr	1990	—	119.9	—	128.5
May	1990	—	118.9	—	128.7
June	1990	—	116.6	—	—
July	1990	—	116.4	—	—

P = Preliminary   **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 =100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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GOVERNMENT STATISTICS

CANADA

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	—	—	—	—	—
1981	Avg.	83.4	75.5	—	—	—	—	—
1982	Avg.	89.0	83.7	—	—	—	—	—
1983	Avg.	92.1	88.5	17.22	—	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	—	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.3	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.2	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.5	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92R	20.18R	18.66R	14.34R	15.20
Aug	1990	109.2	119.8	23.87P	20.38P	18.85P	14.53P	15.34P
Sept	1990	109.9	120.2	—	—	—	—	—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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SOUTH AFRICA

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	—	—
Aug	1990	—	—	206.5	199.8	—	—
Sept	1990	—	—	209.7	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average for indicated year.

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GOVERNMENT STATISTICS

UNITED STATES

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.7	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.6	13.59	13.72	13.09	10.05
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.13
Mar	1990	113.2	114.2	128.7	129.7	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5R	114.6R	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.1	114.2	129.9	130.9	14.00	14.31	13.51	10.27
July	1990	113.2	114.3	130.4	—	14.29R	14.49	13.58R	10.34
Aug	1990	115.9	116.5	131.6	—	14.24P	14.60P	13.55R	10.32R
Sept	1990	118.3	118.3	132.7	132.1	—	—	13.63P	10.42P

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, D.C.: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, D.C.: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, D.C.: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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VOLUME AND PRICE OF URANIUM DELIVERIES TO THE EUROPEAN COMMUNITY[1]

(Compiled from data published by the Euratom Supply Agency)

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

R = Revised

[1] The twelve European Community member nations are Belgium, Denmark, France, West Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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GOVERNMENT STATISTICS

US URANIUM MARKETING ACTIVITIES STATISTICS
(Compiled from data published by the US Energy Information Administration)[1]

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] (\$/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	14.8	$19.14	1.0
1988	13.1	17.6	$25.65	15.8	$19.03	3.3

---

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*
1984-1988: Energy Information Administration, *Uranium Industry Annual*

[2] Data for 1976-1981 includes both domestic utilities and agents

[3] Includes imports by domestic utilities and domestic suppliers

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Monthly Report

December 1990 Number 268

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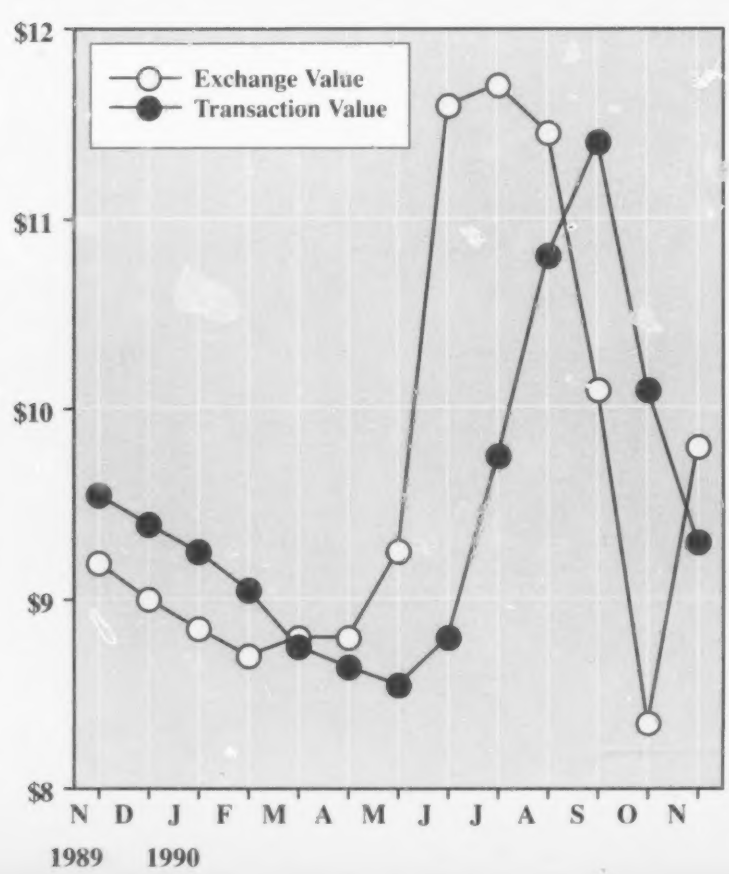
United States Energy Outlook: New Challenges, New Directions 25



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Speech 25
- **United States Energy Outlook: New Challenges, New Directions**

J. Robert Wolcott, Chairman of NUEXCO's International Advisory Committee, spoke to members of the British Parliament on the outlook for the US electrical industry. Energy sources have to be examined as a group, and alternatives evaluated realistically.

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To Our Readers

We are pleased to announce that Susan L. Miller has joined NUEXCO. Susan was formerly Director of Budgets and Operations Analysis at Kennecott Corporation's Salt Lake City headquarters. She recently produced a development plan for Kennecott's investment in the Green Mountain Uranium Project in Wyoming—a joint venture with US Energy Corporation. Susan has also worked for British Petroleum and Standard Oil of Ohio, and has a broad range of experience including positions in technical sales, planning, budgeting, and project management. Susan earned a Bachelor of Arts degree from Penn State University and a MBA degree from Cornell University.

Susan will work as a commercial representative, initially in Denver, within NUEXCO's trading group. We welcome Susan to the organization.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report November 30, 1990	Last Report October 31, 1990	12 Months Ago November 30, 1989
EXCHANGE VALUE[1]	**\$9.80**/lb equivalent U_3O_8	\$8.35	\$9.20
UF_6 VALUE[2]	**\$28.75**/kg U as UF_6	\$24.75	\$27.75
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.45**/lb U as UF_6	\$1.45	\$1.75
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$51**/SWU	\$51	\$57
TRANSACTION VALUE[6]	**\$9.30**/lb equivalent U_3O_8	\$10.10	\$9.55
Transactions	16	12	17
Months	3	3	3
Millions of Pounds	3.0	2.3	3.5

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend. Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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NOVEMBER MARKET REVIEW

(as of November 30, 1990)

OVERVIEW

Rebounding from last month's record percentage decreases, both the Exchange Value and the UF_6 Value recorded their second-largest percentage increases ever. The Exchange Value rose over 17 percent, to $9.80 per pound U_3O_8. Similarly, the UF_6 Value rose 16 percent, to $28.75 per kgU as UF_6. In early November, a number of discretionary buyers emerged when prices were in the mid–eight dollar range. As some sellers completed sales, others withdrew from the market temporarily; consequently, supplies tightened and prices quickly rose above nine dollars per pound. By month-end, concentrates sales were being made in the high nine-dollar range.

During November, nine near-term natural uranium sales involved a total of nearly two million pounds equivalent U_3O_8. Eight sales involved concentrates, the other involved natural UF_6. In addition, one long-term concentrates sale is reported. Total near-term uranium volume through November 1990 now exceeds 39 million pounds equivalent U_3O_8 (**Table 1**). A preliminary review of 1990 market developments is presented in an article beginning on page 20.

The Loan Rate at 3.5 percent per annum, the Conversion Value at $1.45 per pound U as UF_6, and the SWU Value at $51 per SWU all remain unchanged. One loan involving over 300 thousand pounds equivalent U_3O_8 is reported. No conversion sales are reported. In the enrichment market, one near-term SWU sale for a small quantity was concluded.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	November 1990		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	8	2.0	63	23.0
Natural UF_6	1		33	9.5
EUP	0	0.0	12	7.0
Total	**9**	**2.0**	**108**	**39.5**

[1] million pounds equivalent U_3O_8

NATURAL URANIUM AND CONVERSION

The **Exchange Value** rose $1.45, to **$9.80** per pound U_3O_8. This 17.4% increase is the second-largest percentage increase in the history of the Exchange Value and is particularly dramatic, as it occurs immediately after October's record 17.3% decrease. Such market volatility is rare, and thus astonished many market participants. Prior to mid–1990, market prices had shown greater month–to–month stability since early 1984.

During late October and early November, sellers competed aggressively for limited sales opportunities. As a result, market price levels reached all-time low levels (after adjustment for inflation). The record low levels led to a new influx of discretionary buyers seeking material. Furthermore, several transactions removed some supplies as well, so near-term supplies tightened and higher prices developed.

Unlike the market in June, when some buyers had to purchase material and thus had to chase rising prices, November's discretionary buyers began to withdraw from the market as prices rose past nine dollars. Some buyers did not seem concerned about a price increase, and even elected not to purchase after evaluating the offers they received. In addition, some sellers entered the market and several others indicated their willingness to sell near $10 per pound. These events limited the price increase.

Nine near-term natural uranium sales are reported for November. Eight of the sales involved concentrates; volume exceeded 1.8 million pounds equivalent U_3O_8. Early November sales were priced near the October 31 Exchange Value, but by month-end, sales were being concluded at substantially higher levels. Most of the near-term concentrates activity involved North American market participants. All of the sellers, and all but one buyer were North American. The majority of buyers were producers, and nearly all of the sellers were intermediaries.

* * *

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Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply [1]	Active Demand [1]
• Natural Uranium [2] (thousand lbs equivalent U_3O_8)	4,745	1,795
• Supply/Demand Ratio:	2.6	
• Loan (thousand lbs equivalent U_3O_8)	9,305	0
• Conversion (thousand lbs U as UF_6)	0	725
• SWU (thousand SWUs)	350	205

[1] Supply and demand tables in the current market data section of this Report provide details for each category.
[2] Includes concentrates and hexafluoride.

Following the Exchange Value, the **UF_6 Value** jumped to **$28.75** per kgU as UF_6. This $4.00 (16.2%) increase is the second-largest increase (in both absolute and percentage terms) since the UF_6 Value was first published on April 30, 1985, exceeded only by the June 30, 1990 increase of $6.50 (25.5%). Market activity in the UF_6 market paralleled that of the concentrates market; low-priced offers early in the month enticed several discretionary buyers, which led quickly to higher prices by mid–month. Discretionary buyers in the market were receptive to either concentrates or UF_6, but most chose concentrates. Only one UF_6 sale, occurring near the end of the month, is reported. This transaction between two intermediaries took place near the November 30 UF_6 Value

* * *

The **Transaction Value** declined $0.80, to **$9.30** per pound U_3O_8 based on 16 transactions over 3 months involving 3.0 million pounds equivalent U_3O_8. The lower-priced sales from October and the higher-priced sales of September are about equally weighted above and below the average November sale price and effectively counter-balance one another. Thus, the Transaction Value, because it is a three-month weighted average, has smoothed out the volatility of the past few months.

Active uranium supply increased slightly to **4.7** million pounds equivalent U_3O_8. **Active uranium demand** also increased slightly to **1.8** million pounds equivalent U_3O_8. At the beginning of the month, a large imbalance existed with near-term supply greatly exceeding demand, but the influx of discretionary buyers quickly tightened supplies. As prices consequently rose, discretionary demand slipped and additional supply emerged, thus, by month-end the near-term **supply/demand ratio** was **2.6**, only slightly lower than at the beginning of the month.

* * *

In the **long-term natural uranium market**, only one sale is reported this month. A US utility purchased over 600 thousand pounds equivalent U_3O_8 in the form of concentrates from a producer. The contract uses market-related pricing terms and provides for delivery during the period 1992-1994.

Competition for long-term uranium contracts remains intense. In October, one European utility had received 15 long-term concentrates offers. Late in November, a US utility seeking concentrates for delivery in 1994-1998 received offers from an even greater number of sellers. While sellers seek to conclude long-term contracts at higher prices, the current competitive environment favors buyers in their pursuit of lower prices and greater flexibility.

* * *

The **Loan Rate** remains at **3.5** percent per annum. Only one loan is reported, in which a producer borrowed over 300 thousand pounds equivalent U_3O_8 from a utility. Loan supply decreased just slightly, but still remains in excess of nine million pounds equivalent U_3O_8, while identifiable loan demand remains at zero (**Table 2**).

* * *

The **Conversion Value** is unchanged at **$1.45** per pound U as UF_6. No conversion transactions are reported.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** remained at **$51** per SWU. Only one near-term SWU sale is reported. A European utility purchased a small quantity of SWU from an intermediary at an unknown price. In addition, four long-term SWU sales that occurred earlier in 1990 are reported; more than two million SWU will be delivered during the period 1994-2002. No enriched uranium product sales are reported. ■

Table 3
ENRICHMENT PRICES
(November 30, 1990)

Prices	This Month Report 268	Last Month Report 267	12 Months Ago Report 256
NUEXCO SWU Value ($US per SWU)	51	51	57
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U_{235}	206	190	212
2.5 w/o U_{235}	284	263	294
3.0 w/o U_{235}	364	339	378
3.5 w/o U_{235}	446	416	465
4.0 w/o U_{235}	528	494	552
4.5 w/o U_{235}	612	573	640

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
4975	1990	50-100	below 90	Producer	Intermediary	
4977	1992-1994	601-1,000	See Remarks	Utility	Producer	Price Related to Market
4988	1990	301-600	below 90	Intermediary	Producer	
4989	1990	101-300	90-97	Producer	Intermediary	
4990	1991	101-300	90-97	Utility	Intermediary	
4991	1990	Less Than 50	90-97	Producer	Intermediary	
4994	1990	101-300	90-97	Producer	Intermediary	
4996	1991	301-600	**R**	Utility	**R**	
4997	1991	101-300	98-102	Producer	Intermediary	
4998	1991	101-300	98-102	Intermediary	Intermediary	UF_6

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
4979	1990	301-600	98-102	Producer	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks

No conversion sales are reported

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
4982	1994-2002	101-300	**R**	Utility	Producer	Occurred Earlier in 1990
4983	1994-2002	601-1,001	**R**	Utility	Producer	Occurred Earlier in 1990
4984	1994-2002	301-600	**R**	Utility	Producer	Occurred Earlier in 1990
4985	1994-2002	1,001-3,000	**R**	Utility	Producer	Occurred Earlier in 1990
4999	1991	less than 50	**R**	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale:				
ACTIVE				
90-1078A*	1,045	1,045 per year	1991-1993	UF_6e
90-1227*	500	—	1990	
90-1231	500	500 per year	1990-1995	—
90-1249	700	—	1990-1991	
90-7001*	2,000	1,000 per year	1991-1995	
Total	**4,745**			
INACTIVE	**1,850**			
Available for Loan:				
ACTIVE				
88-1182	4,400	—	U_3O_8/UF_6	
90-1016	1,000	—	U_3O_8	
90-1108	1,000	—	U_3O_8	
90-1180	525	—	U_3O_8	
90-1208	280	—	UF_6	
90-1230	1,000	—	U_3O_8	
90-1260	1,000	—	UF_6	
90-1275*	100	—	U_3O_8	
Total	**9,305**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 90-1212

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term [1]	Intermediate or Long-term [2]		
Inquiries to Purchase:				
ACTIVE				
90-1100A	45	—	1991	UF_6e
90-1182	25	—	1991	
90-1235B*	250	—	1991	
90-1267*	100	—	1990-1991	
90-1271*	145	—	1990	UF_6
90-1274*	500	—	1991	
90-1276*	300	—	1990-1991	
90-1277*	130	80 per year	1991-1994	
90-1284*	300	—	1991	
90-1170	—	290	1992-1996	
90-1205	—	260 per year	1992-2001	UF_6
90-1226	—	1,045 per year	1992-1996	UF_6
90-1240	—	260 per year	1994-1996	U_3O_8/UF_6
90-1254A	—	250 per year	1993-1996	U_3O_8/UF_6
90-1256	—	500 per year	1994-1998	U_3O_8/UF_6
90-1281*	—	260 per year	1993-1996	
Total	**1,795**			
INACTIVE	**2,625**			
Inquiries to Borrow	*No inquiries to borrow are reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1229, *90-1241*, *90-1262*.
Active Projects removed since last month: *90-1206*, *90-1255*, *90-1258*.

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years [1]	Beyond 3 Years [1]	Remarks
Available for Sale:	*No offers to sell are reported*		
Inquiries to Purchase:			
ACTIVE			
90-1259	210	—	1991
90-1264*	295	—	1991
90-1282*	220	—	1991
90-1254C	—	210	1993-1996
Total	**725**		
INACTIVE	*None reported*		

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *90-1261.*

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs)		Delivery Period	Remarks
	Spot or Near-term [1]	Intermediate or Long-term [2]		
Available for Sale:				
ACTIVE				
88-1006*	150	--	1991	
90-1078B*	200	435 per year	1991-1993	UF_6e
90-7000	—	1,000	1991 on	
Total	**350**			
INACTIVE	*None reported*			
Inquiries to Purchase:				
ACTIVE				
90-1100B	15	—	1991	UF_6e
90-1224	40	100 per year	1991-1995	
90-1225	150	—	1991	
88-1061	—	500	1991-1995	
90-1076	—	350 per year	1992-1998	
90-1094	—	500	1992-2000	
90-1144	—	60 per year	1992-2001	
90-1181	—	600	1996-2003	UF_6e
90-1196	—	60 per year	1995 on	
Total	**205**			
INACTIVE	**155**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *90-1251.*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)	per kg U as Concentrates This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)
Australia (dollar)	12.70	10.65	11.79	33.02	27.69	30.66
Belgium (franc)	304.73	260.12	345.48	792.22	676.27	898.16
Canada (dollar)	11.41	9.74	10.73	29.66	25.33	27.89
EEC (ecu)	7.11	6.16	8.05	18.48	16.02	20.93
Finland (markka)	35.32	30.06	38.62	91.82	78.15	100.41
France (franc)	49.81	42.29	56.10	129.49	109.95	145.84
Germany (mark)	14.76	12.63	16.45	38.38	32.85	42.76
Italy (lira)	11,088	9,465	12,131	28,828	24,607	31,537
Japan (yen)	1,307	1,075	1,314	3,399	2,794	3,417
Netherlands (guilder)	16.66	14.24	18.55	43.30	37.03	48.22
So. Africa (comm. rand)	24.55	21.26	23.93	63.82	55.28	62.22
Spain (peseta)	935.92	791.54	1,060	2,433	2,058	2,755
Sweden (krona)	83.40	46.91	58.67	216.83	121.96	152.53
Switzerland (franc)	12.57	10.70	14.65	32.69	27.81	38.08
UK (pound)	5.06	4.27	5.88	13.15	11.11	15.28
US (dollar)	9.80	8.35	[illegible]	25.48	21.71	23.92

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)	per kg U as Concentrates This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)
Australia (dollar)	12.05	12.88	12.24	31.34	33.49	31.83
Belgium (franc)	289.18	314.64	358.62	751.80	818.00	932.33
Canada (dollar)	10.83	11.79	11.14	28.14	30.64	28.95
EEC (ecu)	6.74	7.45	8.36	17.53	19.38	21.72
Finland (markka)	33.52	36.36	40.09	87.14	94.53	104.23
France (franc)	47.27	51.16	58.23	122.89	133.00	151.39
Germany (mark)	14.01	15.28	17.07	36.42	39.73	44.38
Italy (lira)	10,523	11,449	12,592	27,357	29,764	32,737
Japan (yen)	1,241	1,300	1,364	3,225	3,379	3,547
Netherlands (guilder)	15.81	17.23	19.25	41.09	44.79	50.06
So. Africa (comm. rand)	23.30	25.72	24.84	60.57	66.86	64.59
Spain (peseta)	888.17	957.44	1,100	2,309	2,489	2,860
Sweden (krona)	79.15	56.74	60.90	205.77	147.52	158.33
Switzerland (franc)	11.93	12.94	15.20	31.02	33.64	39.53
UK (pound)	4.80	5.17	6.10	12.48	13.43	15.86
US (dollar)	9.30	10.10	9.55	24.18	26.26	24.83

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[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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NUEXCO

MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

	per lb U as UF₆			per kg U as UF₆		
Country (currency)	This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)	This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)
Australia (dollar)	1.88	1.85	2.24	4.14	4.08	4.95
Belgium (franc)	45.09	45.17	65.72	99.40	99.59	144.88
Canada (dollar)	1.69	1.69	2.04	3.72	3.73	4.50
EEC (ecu)	1.05	1.07	1.53	2.32	2.36	3.38
Finland (markka)	5.23	5.22	7.35	11.52	11.51	16.20
France (franc)	7.37	7.34	10.67	16.25	16.19	23.52
Germany (mark)	2.18	2.19	3.13	4.82	4.84	6.90
Italy (lira)	1,641	1,646	2,307	3,617	3,624	5,087
Japan (yen)	193.44	186.62	250.00	426.45	411.42	551.16
Netherlands (guilder)	2.46	2.47	3.53	5.43	5.45	7.78
So. Africa (comm. rand)	[illegible]	3.69	4.55	8.01	8.14	10.04
Spain (peseta)	138.48	137.45	201.57	305.29	303.03	444.38
Sweden (krona)	12.34	8.15	11.16	27.21	17.96	24.60
Switzerland (franc)	1.86	1.86	2.79	4.10	4.10	6.14
UK (pound)	0.75	0.74	1.12	1.65	1.64	2.46
US (dollar)	1.45	1.45	1.75	3.20	3.20	3.86

SWU Value And UF₆ Value[1]

	SWU Value at 0.30 w/o Tails Assay			UF₆ Value per kg U as UF₆		
Country (currency)	This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)	This Month (Nov. 30, 1990)	Last Month (Oct. 31, 1990)	12 Months Ago (Nov. 30, 1989)
Australia (dollar)	66.10	65.05	73.08	37.27	31.57	35.38
Belgium (franc)	1,586	1,589	2,140	893.97	771.03	1,036
Canada (dollar)	59.35	59.52	66.46	33.47	28.88	32.18
EEC (ecu)	36.99	37.64	49.87	20.85	18.27	24.14
Finland (markka)	183.80	183.60	239.29	103.61	89.10	115.86
France (franc)	259.21	258.32	347.56	146.12	125.36	168.29
Germany (mark)	76.83	77.17	101.89	43.31	37.45	49.33
Italy (lira)	57,705	57,810	75,158	32,530	28,055	36,392
Japan (yen)	6,804	6,564	8,143	3,835	3,185	3,943
Netherlands (guilder)	86.68	87.00	114.92	48.86	42.22	55.64
So. Africa (comm. rand)	127.76	129.87	148.28	72.02	63.03	71.80
Spain (peseta)	4,871	4,835	6,565	2,746	2,346	3,179
Sweden (krona)	434.04	[illegible]	363.50	244.68	139.04	176.00
Switzerland (franc)	65.43	65.33	90.75	36.89	31.71	43.94
UK (pound)	28.32	26.09	36.41	14.84	12.66	17.63
US (dollar)	51.00	51.00	57.00	28.75	24.75	27.60

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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RECENT DEVELOPMENTS

USA

NRC Investigates Sequoyah Fuels

Sequoyah Fuels Corporation's uranium processing plant has recently come under NRC scrutiny following discovery of two incidents of on-site soil contamination. During the most recent shutdown of its Gore, Oklahoma facility for routine annual maintenance, Sequoyah excavated two underground tanks as a part of the Environmental Protection Agency's new requirements. When the tanks were excavated in early August, Sequoyah personnel discovered the soil had been contaminated by liquid seeping from under the adjacent solvent extraction building. This contamination is believed to have occurred prior to 1988 when General Atomics acquired the Sequoyah facility. Some of the numerous Sequoyah samples registered uranium contamination of 1 to 8 grams per liter, a level 35,000 times the 225 micrograms per liter level that requires corrective action, but only 5.3 times the permissible concentration for the restricted area. Sequoyah reported the discovery on August 22, despite its belief that existing regulations did not require such a report. The NRC's region IV promptly sent an augmented inspection team (AIT) to investigate. When a second, similar condition was discovered and reported by Sequoyah on September 14, the NRC assigned inspectors to the plant seven days a week. The NRC also required Sequoyah to conduct extensive hydrologic studies and seepage-control upgrades, and submit the results by October 31.

The AIT's 32-page report, dated October 11 and released on October 25, criticized Sequoyah management on various grounds, essentially all of which relate to the delays between Sequoyah's discoveries and its reports to the NRC. The report did commend Sequoyah's control of the contamination and protection of employees, once the responsible personnel were made aware of the results of the uranium contamination tests.

Subsequently, NRC Deputy Executive Director of Operations Hugh Thompson issued a "Demand For Information" on November 5. In this directive, the NRC required Sequoyah to (1) commit to an interim management oversight program, to be run by experienced personnel who have never been employed at the Sequoyah facility; and (2) submit a plan for corrective action—which has since been accepted by the NRC. To perform the management overview, Sequoyah hired the firm of Pickard, Lowe & Garrick. In the same directive, the NRC also required that Sequoyah submit by December 5 a plan for an independent, written appraisal of site and corporate activities. Sequoyah has requested proposals for an in–depth review to meet that requirement.

Sequoyah continues to operate the facility and day-to-day operations have not been impacted by the investigation. Sequoyah's NRC license was due to expire September 30, but Sequoyah had made a timely submittal of its license renewal application on August 29, thereby permitting the facility to continue operating during the NRC review of the 10-year renewal application. Quoting a Sequoyah spokesman, Sequoyah is "... committed to fulfilling the expectations of the NRC and to continue meeting (its) customers' requirements and contractual obligations." ■

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WASHINGTON FOCUS

November was a quiet month in Washington. Although Congress has recessed until 1991, the Senate filled vacancies in party leadership positions created by November's elections. The House is expected to proceed with its changes in early December. The Nuclear Energy Forum was held in Washington, DC on November 11-14 to discuss the status of the nuclear industry in the USA. The Forum, held in conjunction with the American Nuclear Society's annual meeting, assembled a large number of CEO's from US, European, and Far Eastern utilities and vendors. The meeting concluded with an announcement by **Philip Bayne**, President of NYPA and chairman of the Nuclear Power Oversight Committee (NPOC), of the results of a year-long NPOC study entitled a "Strategic Plan for Building New Nuclear Power Plants."

Senate Committee Developments

◇ Following the recent elections, the ratio of Democrats to Republicans on the Senate committees is not expected to change. The Senate Energy and Natural Resources Committee, which has jurisdiction over uranium enrichment issues, lost **Senator James McClure** (R-ID), the ranking Republican, when he chose to retire from the Senate. **Senator Pete Domenici** (R-NM) could have become the ranking minority member on the Committee, but declined because he would have had to give up his position as the ranking Republican on the more prestigious Budget Committee. Domenici's decision allowed **Senator Malcolm Wallop** (R-WY) to become the ranking Republican on the Energy Committee.

Now that **Senator Wendell Ford** (D-KY) has assumed a leadership position in the Senate, a uranium enrichment restructuring bill will be one of his top priorities. Progress on an enrichment bill may be slowed by changes at the staff level. The R & D subcommittee of the Energy and Natural Resources Committee lost two knowledgeable staffers with Cheryl Moss' departure and Ben Cooper's promotion to Committee Staff Director. Mr. Cooper may be unable to devote his attention to uranium enrichment, because his time will presumably be divided among all of the issues facing the committee. Mary Louise Wagner, who has been with the committee for several years but responsible for other issues, will likely be assigned uranium enrichment. An unknown factor is the new staff on the Republican side of the committee. With Sen. McClure's retirement and Sen. Wallop's rise to the ranking position, new working relationships must be developed, and the committee may not be able to function in the collegial fashion that has prevailed in the past.

Nuclear Energy Forum

◇ Government and industry representatives gathered for the Nuclear Energy Forum in Washington DC to discuss the status of the US nuclear industry. Representatives from the administration and Congress addressed the Forum on their activities in support of nuclear power. DOE Assistant Secretary for Nuclear Energy **Bill Young** reported on the National Energy Strategy. **Michael Deland**, head of the Council on Environmental Quality (CEQ), said he recently wrote to the NRC demanding the preparation of a full Environmental Impact Statement (EIS) before Shoreham is decommissioned. **Robert White** of the Department of Commerce spoke on the need to develop industry standards. He called on US industry to develop a strategy for influencing world standards organizations, and to concentrate on testing, certification, and verification procedures, so that US companies are not disadvantaged in world trade. Senator McClure spoke of the need for positive leadership, rational decision making and an emphasis on risk assessment in order to assist in the creation of a

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legislative process that will allow nuclear energy to be a viable alternative in the US energy mix. **NRC Chairman Kenneth Carr** spoke about nuclear power plant license renewal and the DC District Court's ruling on 10 CFR Part 52 (plant licensing). Although the NRC is disappointed by the ruling, which rejected the NRC's decision to limit the second hearing's role in the licensing process, the court did affirm the NRC's role in determining the process. The NRC has not yet decided whether to appeal the ruling.

Mr. **John Yasinsky** of Westinghouse talked about the industry's commitment to nuclear power. He noted that nuclear power reduces world oil consumption by 6 million barrels per day. Mr. Yasinsky said if a new nuclear power plant is to be ordered, the ownership sturcture of the new plant will likely be similar to an IPP. The next order probably will not be placed by a single utility, but by a consortium of utilities, vendors, A/E's, and financial institutions, with the backing of a state regulatory agency. **Loring Mills** of EEI said it is unlikely that there will be only one new plant order, because it would serve as a magnet for all anti-nuclear attacks, rather, a group of utilities will announce a series of plants throughout the country. **Anthony Leness** of Merrill Lynch gave a candid assessment of utilities' prospects for attracting the financing necessary for a new nuclear plant order. He noted that investors are not yet aware of the need for new plants, or the industry's desire to build a new nuclear plant. The industry must convince investors that significant changes have been made to the process so that design changes, regulatory delays, or anti-nuclear intervention will not cause the investors financial damage.

Another session focused on the recently-passed Clean Air Law and on global warming, and briefly noted nuclear power's contribution to lowering NOx and SOx emissions. One speaker pointed out that anomalies in timing and the trading of emissions credits permitted by the recently-enacted Clean Air Bill actually favor plants which have some emissions over nuclear plants, which have no emissions. In the short term, this development could put nuclear power at a disadvantage as a market is created for trading these credits. In the long term, it is beneficial for a utility to add nuclear capacity to meet the new tougher standards because emissions must be drastically reduced. **J. Michael Davis** of DOE's Conservation and Renewables Office spoke about the need for more energy efficiency. In developing the National Energy Strategy, DOE considered energy use by sectors. In order to achieve the goal of higher efficiency, it is important to increase the use of electricity across all sectors, but especially important to replace fossil fuel use in the industrial and transportation sectors. Within the commercial sector, DOE has researched electrical demand and how to reduce it. For example, in DOE's headquarters, 40 percent of electrical demand is plug load and is necessary 24 hours a day. (Plug load describes all of the office equipment plugged into the system, whether in use or not, such as computers.) He stated the US cannot assume that increased energy efficiency will consequently lower demand; in fact, demand for electricity could actually increase as its percentage of the total increases.

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Next Nuclear Power Plant Order

◇ In the final speech of the Forum, Phil Bayne, President and COO of New York Power Authority (NYPA), announced NPOC's Strategic Plan for Building a New Nuclear Plant. The industry hopes to establish a framework so that a new order can be placed by 1995 and construction completed by 2000. This plan will serve as a blueprint to create the environment necessary to allow a utility to order a new nuclear plant. Its four primary goals are:

1. Maintain excellent operating records at existing plants.
    - Current plants must maintain their record of safe operation.
    - Make progress on siting HLW repository, an MRS, and LLW sites.
    - Ensure a stable supply of fuel and uranium enrichment (support restructuring legislation).
2. Ensure a stable, predictable regulatory process for licensing.
    - Ask for legislation to streamline licensing.
    - Eliminate dual regulation.
    - One specific goal is NRC approval of GE's ABW reactor design and ABB–CE's System 80+ design by 1992, and Westinghouse's AP600 and GE's simplified BWR designs by 1995.
3. Standardization
    - Finish NRC-certified design of advanced reactors.
    - Coordinate siting with design.
4. Institutional steps
    - Broaden public acceptance at national and local level.
    - Create financing mechanisms.
    - Support state regulatory reform.
    - Enhance government support for new nuclear plants.

The entire project emphasizes communication, so the plan was released to the public to begin a dialogue.

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INDUSTRY BRIEFS

Uranium Mine Closures

On November 8, Umetco Minerals Corporation announced the temporary cessation of mining activities at the La Sal, Sunday, and Dove Creek sites in Colorado and Utah. The White Mesa mill at Blanding Utah was put on standby in October. Late in November, Energy Fuels Corporation announced the temporary shutdown of its Kanab North mine in northern Arizona. The presidents of both Umetco and Energy Fuels cited low-priced imports and continued surplus supplies in the market as the reasons for their mines' temporary closures.

As of September 30, Freegold suspended uranium production at its Joint Metallurgical Scheme project in South Africa, citing rising costs and falling uranium grades as the deciding factors. The government of the Yugoslavian republic of Slovenia has halted production at the Zirovski vrh uranium mine and mill, pending an economic feasibility report that should be released near the end of 1990. After the Slovenian parliament reviews the report, the mine, which had been producing uranium for domestic use, may be permanently closed.

All Ontario New Reactor Plans Halted

Ontario Canada's recently-elected New Democratic Party (NDP) has fulfilled one of its anti-nuclear campaign promises by placing a moratorium on more nuclear plants in the province, and ordering Ontario Hydro to cancel recently-initiated advance engineering work on its 10-plant nuclear plan. New Ontario Premier Bob Rae stated "The moratorium means ... that (Ontario) Hydro's efforts and energies should be directed to conservation and to greater energy efficiency. As far as we (NDP) are concerned, it is a change of course for Ontario Hydro, and I think it is a significant change." The Party's freeze on nuclear planning does not affect Ontario Hydro's planning and construction at its Darlington station, nor the hearings on its 25-year demand/supply plan.

◆ ◆ ◆

B&W and GA Form MHTGR Fuel Joint Venture

Babcock & Wilcox (B&W) and General Atomics (GA) have formed a joint-venture company, named TRISO, to produce fuel and perform related services for modular high-temperature, gas-cooled reactors (MHTGR), such as in the DOE's new production reactor (NPR) program. TRISO, a 50/50 partnership, will be located in Lynchburg, Virginia.

Namibia Seeks Uranium Sales in Japan

In late October, the Namibian Trade Minister visited the Secretary General of the Japanese Energy Bureau and several Japanese utilities, to promote the sale of Namibian uranium. Now that Namibia is independent from South Africa, and therefore no longer subject to international sanctions, there should be no bar to a resumption of Namibian supply to Japan. Although Japanese utilities have long-term supply contracts that run into the mid-1990s, the Japanese Energy Bureau has stated that the country's expanding nuclear programs would offer new supply opportunities, and recommended that existing purchasing programs be re-evaluated. Namibia's Trade Minister will be opening an office in Tokyo to pursue these sales opportunities.

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Minatco Purchases Remainder Of Wolly Project

Minatco Ltd. now owns a 100% interest in the Wolly Project in northern Saskatchewan. Minatco increased its 33% share by purchasing the interests held by the uranium exploration project's former joint-venture partners, Canadian Occidental Petroleum Ltd. and Canadian Nickel Company Ltd. Minatco, an affiliate of the French firm Total Compagnie Française des Pétroles, will continue its exploration efforts this winter.

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CGE Agrees To Relinquish Control of Framatome

CGE (Compagnie Générale d'Electicité; a French energy conglomerate) has agreed to sell 8% of its 52% interest in Framatome S.A. (the French nuclear engineering and construction company) to State-controlled companies for the sum of approximately FF650 million (US$130 million). CGE will no longer hold the majority interest in Framatome, a position that CGE gained early in 1990 by buying an additional 10% interest from the French firm Dumez. Ever since CGE acquired the majority position in Framatome, both Framatome and the French government have used numerous legal challenges in attempts to force CGE to relinquish its majority position in Framatome. Both the State and Framatome wanted a State-controlled company to have the majority interest in Framatome, rather than a privately-owned French company, a goal which is now assured.

Under the new shareholding structure, a joint-holding company, controlled by the State's Commissariat à l'Énergie Atomique (CEA) and Electricité de France (EdF), will hold 46 percent of the Framatome shares, while Credit Lyonnais (a large state-owned bank) will hold five percent, and Framatome's employee association will hold five percent (up from three percent).

Oregon Voters Keep Trojan Nuclear Plant Open

On November 6, nearly 60% of Oregon's voters rejected a measure that sought to close Portland General Electric's (PGE) Trojan nuclear power plant. The second such measure in four years sought to close the plant within a month after the vote. The 1,095 MWe (net) PWR would have been closed until the federal government opened a spent fuel repository. The key issue in the vote became economics, because PGE estimated the replacement cost of the Trojan generation capacity could reach $3 billion over 20 years.

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Soviets Invited To Foratom Meeting, Hungarians Form Society

Representatives from the Soviet nuclear community were invited to Foratom's November 26 meeting in Prague, following their request to observe the meeting. Foratom also invited members of the recently-formed Hungarian Nuclear Society, which has elected Zoltan Szatmary (director of the Central Research Institute for Physics) as its first president. Hungarian officials decided not to create both a nuclear society and a nuclear forum, preferring to focus all their energies in a single group. Without a forum, Hungary will not seek membership in Foratom, a non-governmental association of 14 European national nuclear forums.

Court Overrules NRC In Licensing and Training Issues

In a blow to the nuclear industry's one-step licensing process, the US Court of Appeals for the District of Columbia Circuit overruled key aspects of NRC licensing regulations. Although the court upheld many parts of the new NRC licensing regulations, it ruled that the NRC did not comply with the Atomic Energy Act when the NRC unfairly limited the public's right to petition for a formal adjudicatory hearing after a nuclear power plant's construction is complete, but before the plant's operating license is issued.

The US Supreme Court let stand a lower court's ruling that under the Waste Policy Act of 1982, the NRC must issue its own training regulations, and that it cannot simply endorse the training standards of the Institute of Nuclear Power Operations (INPO; an industry organization for self-improvement). The court's decision did not imply that the currently-used INPO programs were ineffective or inadequate.

Glencar Exploration in Joint Venture with Hungarian Mine

Glencar Exploration, plc. of Ireland has entered into a joint-venture agreement with Hungary's Mecsek Ore Mining Company (MEV) to redevelop and manage the Pecs uranium mine near the Yugoslavian border. For the remainder of 1990, Glencar will provide management and technical services. Starting in 1991, Glencar will be a major joint-venture partner with MEV, and will manage the mine operations, replacing MEV as the operator. The Pecs mine is well-equipped, and has a mill and ore-leaching plant serving the three mines that are open—two mines are already worked out. Annual production is approximately 500 MTU in concentrates, most of which is used to supply domestic reactors.

Soviet Union and Argentina To Cooperate in Breeder Program

Argentina and the Soviet Union signed a nuclear cooperation agreement in Moscow on October 25. With the influx of Soviet expertise, a 2010 target date has been set for bringing a joint Argentine and Brazilian breeder reactor on line. Argentina will supply the plutonium fuel by reprocessing the spent fuel from its Atucha-I reactor at Argentina's Ezeiza reprocessing plant, while Brazil will provide the sodium moderator. All Soviet/Argentine transfers will be covered by IAEA safeguards.

German Loans Revive Atucha-2

Argentina's government has obtained US$133 million in loans from a consortium of German banks, and has indicated that work will resume on the Atucha-2 nuclear station (692 MWe net) in 1991. The loans, which are contingent on Argentina supplying matching funds, are guaranteed by the German government. The loans were first offered in July 1988, but until now, Argentina's government had been unable to provide the required matching funds. The government had been considering closing or selling the plant if financing could not be obtained (Monthly Report #264, August 1990, p. 21).

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ANALYSIS AND COMMENTARY

PRELIMINARY 1990 MARKET REVIEW

OVERVIEW

The uranium market began 1990 with prices at record low levels, large supplies, and relatively modest demand. Though market prices were extremely volatile during the year—sinking to new record lows and achieving record increases, the market situation is now almost exactly the same as at the end of 1989. The underlying near–term oversupply of natural uranium remains unchanged. Natural uranium concentrates are selling between nine and ten dollars per pound U_3O_8 and natural UF_6 is selling between 28 and 29 dollars per kgU. Discretionary demand emerges near eight dollars per pound U_3O_8, but tends to subside above ten dollars per pound. Supply remains abundant for both near- and intermediate-term sale. As a result of the emergence of Eastern European countries as uranium suppliers, the growing role of the Soviet Union and China, and the independence of Namibia, even more material is readily available than at the end of 1989. Until the oversupply situation is relieved on a macroeconomic level, significant and lasting price increases will not be possible.

In 1990, spot market volume has already set yet another record, continuing the trend toward even greater participation in the spot market. Although firm demand is only moderate, low prices are drawing out many discretionary buyers. Through November, over 39 million pounds equivalent U_3O_8 have changed hands in more than 100 near-term sales (**Figure 1**). The previous record volume was 1989's 32.3 million pounds in 107 sales, involving concentrates, natural UF_6, and enriched uranium product (EUP). Increased utility reliance on the spot market, active producer buying to fill contracts, and increased activity by traders all contributed to this year's record results.

The conversion market has been stable. Despite some downward pressure early in the year from a glut of UF_6 relative to concentrates, the conversion value has remained at $1.45 per pound U as UF_6 throughout most of the year. As of year-end, supplies of concentrates and UF_6 are roughly in balance.

The Loan Rate has remained unchanged at 3.5 percent per annum since November 1987. Loans have become a much more important part of the overall uranium market as utilities, producers, and other market participants seek to utilize excess inventories. Active loan supply has been growing all year, reaching nearly ten million pounds equivalent U_3O_8 in October. Additionally, demand remains thin, so there is no upward pressure on the Loan Rate.

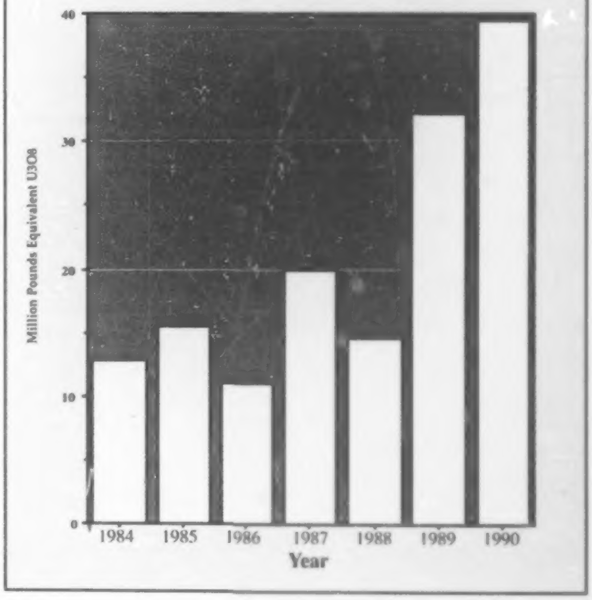
Over the course of 1990, secondary enrichment market prices have been stable as well. SWU market activity has varied from months with no sales and virtually no bids or offers, to months in which millions of SWU changed hands. Yet through it all, the spot price for SWU remained around $50 per SWU; some sales were higher, some lower, but the abundance of SWU contained in enriched uranium within several national stockpiles kept suppliers under competitive pressures all year.

NATURAL URANIUM

Near Term Market Activity

The Exchange Value was $9.00 per pound U_3O_8 as of December 31, 1989; it was $9.80 per pound as of November 30, 1990. In the interim, the Exchange Value reached its all-time low (after adjustment for inflation) of

Figure 1
Spot and Near-Term Market Volume 1984-1990



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$8.35 per pound U_3O_8 on October 31, as buyers postponed purchases due to their lack of concern over a price rise and sellers became even more anxious to move material. The Exchange Value also recorded its all-time record percentage increase, jumping 25.4% from $9.25 to $11.60 on June 30, as many sellers exited the market just before demand increased. The concentrates market displayed these volatile price movements for the following reasons:

- The emergence of China, the Soviet Union, and various Eastern European countries as suppliers or potential suppliers of uranium contributed to a strong market perception of excess uranium on or approaching the market. Other contributing factors included Namibian independence, which led to the removal of sanctions against Namibian material in March 1990; the after-effects of the US-Canada Free Trade Agreement, which effectively silenced proponents of US mining protectionism; and the entrance into the market of a few large inventories of natural and enriched uranium, such as the German stockpile material, the Queensland Mines inventory, and the Sacramento Municipal Utility District's inventory. Furthermore, most traditional producers in the US, Canada, and Australia seemed reluctant or unwilling to shut down high-cost facilities or forego market share until well into 1990.
- Buyers and sellers reacted differently to the general market perception of plentiful supplies. Many utilities deferred or eliminated plans to purchase on a discretionary basis. For sellers, chiefly traders and some producers, optimism over rising prices evaporated during 1990, and many believed that selling at a low price now was preferable to selling at an even lower price later in the year.
- The increasing role of traders in the spot market has made it possible for utilities to depend more heavily on spot market sources without reducing their security of supply. In a market with more participants, emerging supplies can be absorbed more quickly, and new demand brings out more potential sellers. As more spot buyers and sellers move in and out of the market, often simultaneously, wider price swings can result.

In the first half of 1990, the interaction of motivated sellers holding large inventories and price-sensitive discretionary buyers, resulted in a protracted period of low prices. Prices rose sharply in [illegible] through July due to increased demand and sellers' gradual departure from the market. Once prices exceeded $11 per pound, enough sellers re-entered the market to not only halt the price rise, but to cause another steep drop in prices, down to the $8.35 per pound level. Essentially the same cycle appeared to be recurring near the end of the year.

The movement of the UF_6 Value paralleled that of the Exchange Value (**Figure 2**). The UF_6 Value began the year at $26.50 per kgU, moved down to its record low (in current and constant dollars) of $24.40 on March 31, increased a record $6.50 (25%), to $32.00 on June 30, dropped a record 16% ($4.75) on October 31, then rebounded to $28.75 per kgU on November 30. The basic market characteristics of material oversupply and limited firm demand present in the U_3O_8 market were also present in the UF_6 market. Week-by-week movements into and out of the market by discretionary buyers and selective sellers have caused rapid fluctuations in market price levels.

Spot Market Volume

Through November 1990, over 39 million pounds equivalent U_3O_8 have changed hands in 108 uranium transactions (**Table 1**). This record spot market volume represents a 22% increase over 1989. Of 1990's total, EUP accounts for seven million pounds equivalent U_3O_8 in 12 sales; 96 natural uranium sales total over 32 million pounds equivalent U_3O_8. Concentrates sales account for two-thirds of the natural uranium transactions (63 sales involving nearly 23 million pounds) and 70% of the total volume. The 33 natural UF_6 sales account for the remaining one-third of the natural uranium volume and 30% of the volume (over 9 million pounds equivalent U_3O_8).

Table 1
1990 Spot and Near-term Market Volume[1]

Uranium Form	No. of Sales	Volume[2]
Concentrates	63	23.0
Natural UF_6	33	9.5
EUP	12	7.0
Total	**108**	**39.5**

[1] reported as of November 30, 1990
[2] million pounds equivalent U_3O_8

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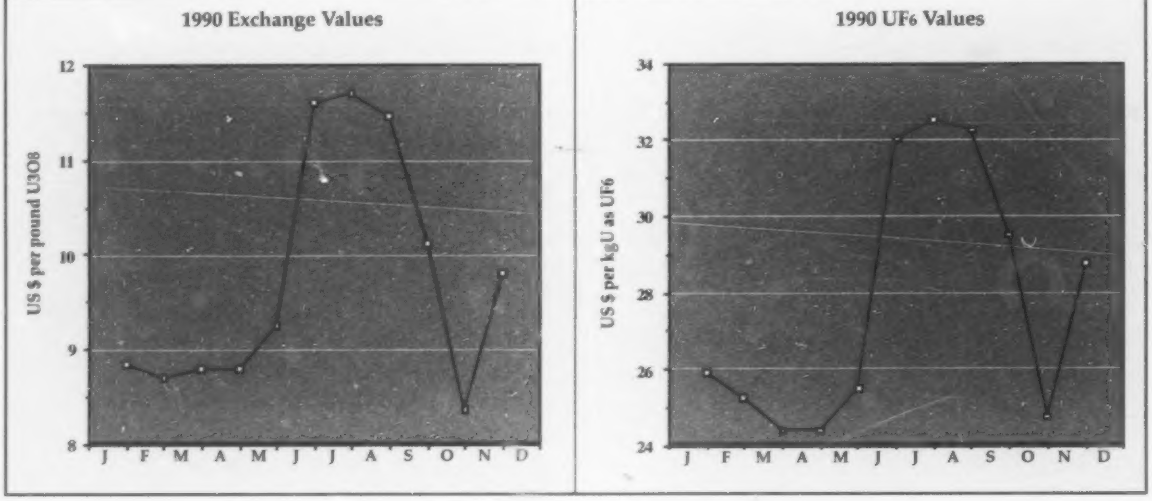
Figure 2
1990 Exchange Values and UF_6 Values



Buyers

In a non-traditional role as buyers, producers purchased more than 8 million pounds equivalent U_3O_8 in 33 of the 96 natural uranium transactions. Australian, Canadian, and US producers all bought uranium during 1990. As usual, utilities were the most active buyers, accounting for nearly 12 million pounds in 39 spot market purchases. Intermediaries bought over 10 million pounds in 16 near-term purchases. However, this volume figure is abnormally weighted by one transaction in which a European intermediary purchased a nearly seven-million-pound inventory. That single transaction accounted for almost 70% of the material bought by intermediaries on the spot market.

Sellers

Intermediaries have been the most active sellers thus far in 1990, selling 19 million pounds in 67 transactions. Producers made fewer sales (18 transactions totalled over 11 million pounds), but at a higher average volume per sale. Producer sales averaged 640 thousand pounds, while intermediary sales averaged 285 thousand pounds. Utilities, convertors, fabricators, and all other market participants accounted for less than one percent of the volume in 11 sales. Producers often were able to buy at low prices and choose between reselling the material if the spot price rose, or delivering the purchased material under long-term contracts (instead of producing material). As a result, they have sometimes played the dual role of producer–trader.

Long-term Market Activity

As in the spot market, long-term market volume has grown, exceeding last year's level of 34 million pounds. The 34 long-term natural uranium contracts concluded thus far in 1990 involve nearly 46 million pounds equivalent U_3O_8 (**Table 2**). Deliveries began as early as this year, and some extended to 2001. Individual quantities ranged from as low as 225 thousand pounds delivered over three years, to over three million pounds delivered over six years. Of the 34 sales, 27 involved concentrates, the other seven involved UF_6. US parties comprised the majority of the buyers (25 purchases); European utilities made up the balance (9 purchases). Producers (primarily North American) were the major sellers, concluding 24 of the 34 long-term contracts. Intermediaries concluded the balance of the intermediate and long-term sales.

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Lower spot market prices led to more competitive long-term pricing terms as well, particularly in the ten contracts that included base-escalated pricing mechanisms. Seventeen of the 34 sales involved market-related pricing terms, and the other seven used a series of fixed prices. Two sales use a combination of the different types of pricing terms.

As prices reached all-time lows, market-related contracts are being concluded with smaller discounts than in the past and often with "soft" floors. Soft floor prices allow a producer to walk away from delivery if the contract price is below that level. Although discounts in the past have been as large as five percent or more off the defined market price, recent transactions indicate most discounts fall in the 1–2% range. Sellers are beginning to give full recognition to the risk inherent in contracting long-term based on spot-market pricing.

CONVERSION

The Conversion Value remained stable throughout 1990. Beginning the year at $1.50 per pound U as UF_6, it declined slightly to $1.45 per pound U on March 31, and has remained at that level since. Early in the year, an overabundance of UF_6 relative to concentrates put some downward pressure on conversion prices. But this inequality between the UF_6 Value and the sum of the values of its components—concentrates and conversion—served only temporarily to make UF_6 a more attractive form of uranium. Buyers seeking conversion services on the secondary market usually concluded transactions at or near the prevailing Conversion Value.

On a few occasions during the year, a conversion sale would be made at a significant discount from NUEXCO's published Conversion Value. In all cases the seller, usually an intermediary, was holding UF_6 but needing U_3O_8. The seller was then forced to entice a discretionary buyer to purchase conversion by taking the seller's UF_6 and returning U_3O_8. In order to accomplish this, a very low price, sometimes below $1.00 per pound U, would be required. Such transactions were sufficiently rare that they did not influence the secondary conversion market to a significant degree. When a utility issued a request for spot market conversion services, transactions typically occurred at or near prices represented by the NUEXCO Conversion Value.

Sixteen near-term conversion sales have been reported through November 1990. Nearly all of the buyers were utilities, purchasing primarily from intermediaries and convertors. Total volume is well over five million pounds U equivalent. About two-thirds of sales involved US market participants; the remaining third had European buyers and sellers. Two intermediate-term conversion sales have also been reported in 1990; two European utilities purchased a total of nearly one million pounds U equivalent for delivery during the period 1990–1992.

Table 2
1990 Long-Term Natural Uranium Contracts

Form	No. of Sales	Total Volume (million lbs equivalent U_3O_8)	Deliveries
Concentrates	27	40.6	1990-2001
UF_6	7	5.0	1990-1995
Total	**34**	**45.6**	

Pricing Terms	No. of contracts
Market Related	17
Base-Price Escalated	10
Fixed Prices	7
Total	**34**

URANIUM LOANS

Natural uranium loans have emerged as a major source of supply in the market, filling spot demand and thereby deferring purchases until a later date. At least ten million pounds of active loan supply has been available in 1990. The Loan Rate has remained unchanged at 3.5 percent per annum since November 1987.

A total of nearly 14 million pounds equivalent U_3O_8 has been borrowed in 29 different natural uranium loans so far this year. Individual loan quantities have ranged from below 200 thousand pounds to 1.2 million pounds equivalent U_3O_8. Intermediaries have borrowed the majority of the material, although several producers and a few

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utilities have borrowed uranium as well. Lenders have primarily been utilities (46% by weight) and producers (27% by weight); intermediaries and fabricators made up the balance. US parties make up over two-thirds of the borrowers and just less than two-thirds of the lenders; European parties account for most of the remaining loans.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The SWU Value began the year at $54 per SWU and dropped to $50 per SWU on February 28. In essence, the drop was the continuation of a slide in SWU prices that began in late 1989. In the face of several large inventory liquidations, the SWU Value dropped from $66 per SWU on July 31, 1989 to $50 by February 28, 1990. Since then, secondary enrichment market price levels have been fairly consistent, despite large month-to-month variations in volume. The SWU Value remained at $50 until October 31, when it edged upward to $51 per SWU.

Market activity varied significantly each month. The months of April, August, and October had zero or only one reported enrichment transaction; June and November had numerous sales, in which several million SWU changed hands, including a few long-term sales. Through November, a total of 1.7 million SWU was purchased in 25 near-term SWU and EUP transactions. SWU-only sales (those sales in which the uranium feed component was not also sold) totalled 700 thousand SWU in 13 near-term sales. With only two exceptions, every near-term SWU sale was made between a utility buyer and an intermediary seller. Twelve near-term EUP sales have been reported this year, accounting for the balance of slightly over one million SWU and almost 7 million pounds equivalent U_3O_8. SWU buyers and sellers were about equally split between European and US market participants. Additionally, eight long-term SWU-only purchases, all made by utilities, totalled over 4.5 million SWU for deliveries through 2002; one long-term EUP sale to a Far East utility totalled nearly two million SWU and nearly 8 million pounds equivalent U_3O_8 for delivery during the period 1990–1999.

Fundamentally, the SWU market during 1990 was similar to the past several years. Because of the prevalence of requirements-type contracts for enrichment services (particularly the USDOE's Utility Services Contract), only a handful of buyers enter the market each year. In the USA, two or three utilities each looking for 100-150 thousand SWU per reload, and four or five utilities each looking for 20-50 thousand SWU per reload, can be expected to solicit bids. In Europe, where utilities generally have a greater mix of contracts involving Eurodif, Urenco, TENEX, and DOE, demand tends to fluctuate. In an average year, four to six utilities typically will purchase approximately 50 thousand SWU each. The SWU demand situation should continue until about 1994–1996, when the expiration of DOE's Incentive Price II Proposal will cause some utilities to increase spot–market purchasing, unless DOE makes an attractive IP III offer in the meantime. ■

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UNITED STATES ENERGY OUTLOOK: NEW CHALLENGES, NEW DIRECTIONS

J. Robert Wolcott, Chairman of NUEXCO's International Advisory Committee, presented the following speech to the British Nuclear Forum's Symposium on Nuclear Power–for Members of the British Parliament, held in London on November 21, 1990.

THE UNITED STATES AND ENERGY

The United States has an energy problem. Electrical capacity has grown only 1% per year, while consumption has grown 4% per year. The United States uses about one quarter of the world's oil production. More than half of the oil consumed each day is imported—about 9 million barrels. Environmental restraints may curtail the use of fossil fuels. About one quarter of the world's nuclear electricity is produced in the United States, but new construction has halted. Unrealistic hopes are being placed on unproven technologies.

The mood of the United States, like other countries, alternates. Complacency prevails during periods of calm; expediency prevails during periods of crisis. The solutions attempted while in either mood produce conflict, for they tend to pit one region against another; one economic class against another; and one ideology against another.

The Need For Electrical Energy

A starting point is electrical power need. There are those who argue that more electrical capacity is unnecessary, and that even less is desirable. On the other hand, history closely links economic progress and electrical growth—a history that cannot be ignored.

During the period of economic prosperity prior to 1970, electrical demand grew at a rate of 7% per year. The growth rate then slowed. In the past few years, the growth rate of electricity demand has been approximately 4% per year. Forecasts for the next decade are for 2.5% to 3% growth per year. Even that modest rate will require 150 to 200 additional large plants, none of which are yet started.

Electrical energy has been replacing other forms of energy. Over the past 15 years, while total energy consumption changed very little, electrical energy consumption increased 50%, and more uses for electricity are certain. Electric-powered automobiles are an example. General Motors recently announced commercial use of such automobiles is expected in a few years. California's recent efforts to reduce air pollution resulted in a mandate that, by 1998, 2% or more of all automobiles sold in the state must be electric-powered.

TWO RECENT CHALLENGES

The electrical industry has changed directions several times in the past, mainly, though not wholly, for economic reasons. Fifty years ago, hydroelectric power was favored. As demand exceeded hydro capability, gas and oil use grew. After oil embargos alarmed the nation in the 1970s, the emphasis shifted to coal and nuclear. Later, opposition to nuclear cast coal in the role of the "fuel of the future." Current circumstances encourage natural gas use, even though its use is not a long-term solution.

Today the electrical industry has two challenges of newly-assumed importance; atmospheric pollution (especially that associated with global warming) and political ideology.

Global Warming

Smog, acid rain, and concerns about ozone depletion are long standing atmospheric problems. However, in recent years, the media has focused on global warming, and therefore public concern has jumped to a new level. Energy production has attracted special attention, as many often claim that three-fourths of all carbon dioxide results from the burning of fossil fuels, and that most global warming is caused by carbon dioxide.

The scientific community is not in agreement as to the causes or effects, or even of the evidence of global warming. Weather analysis is enormously complex, with

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all the weather's interdependent relationships of solar radiation, atmospheric composition, land and sea masses, living organisms, and numerous other global and localized variables.

These interdependencies are not fully understood. Weather models designed to detect global warming require such extensive calculations that the most advanced computers may require a year or more to compute the results. Additionally, the historical data that is available for the weather models may not be accurate enough to determine the minute indicators of global warming.

Partly due to inconclusive results on global warming, views are divided, and often emotionally supported. One line of argument is that, global warming dangers are so great that, despite the uncertainties, drastic action must be taken and without delay. Another line of argument is that, the economic and social costs from drastic actions, especially if misguided, will be so damaging that more reliable scientific evidence is essential before any such drastic and major action is initiated.

Government policy follows the latter—the cautious line. However, the media having declared itself "pro-environment," portrays global warming as though the worst is certain. Pro-environment programs, with alarmist labels such as *Race to Save the Planet* (a public television series), are becoming commonplace. Whether global warming is as serious as some claim will not be known for decades. What we do know now is that, much of the public's attitude is being influenced as though global warming is real and serious.

Ideology

A couple of decades ago, energy decisions were based on engineering and economics. Under this "old system," facts were collected, analyzed, and blended with the experienced judgement of knowledgeable professionals. In this way, key decisions were made.

Today, political considerations often reverse the process, so that the most politically desirable end, rather than the most practical end, may be favored. The enthusiasm of the "true believer" often becomes more influential than the knowledge of the professional. Supporting rationales which follow such a selection may be much like the *Alice In Wonderland* sequence: "Verdict first, trial later."

ENERGY RESOURCES

Fossil Fuels

Energy producing sources have to be examined as a group, and not criticized one by one. Coal, oil, and natural gas provide nearly three quarters of all electrical power generation. Like all fossil fuels, each of these has advantages and disadvantages.

Coal

Fifty-seven percent of electrical generation is fueled by coal; it is economic and reserves are adequate for 300 years. But, coal is the worst of fossil polluters.

Outlook and Opinion — Further restrictive environmental regulations will retard, but not stop, the expanded use of coal. Support for "clean coal" will grow.

Oil

Oil is essential for home heating, petrochemical production, and other uses, but not for electrical power production. Less than 5% is used for electrical power. Oil produces 80% as much carbon dioxide as coal.

Outlook and Opinion — The use of oil to fuel electricity generation will be virtually phased out.

Natural gas

Natural gas is relatively abundant and may be sourced wholly from the United States and Canada. Carbon dioxide emissions are 60% of those of coal and 75% those of oil. However, natural gas is not available in all major consumption centers.

Outlook and Opinion — Natural gas is not a long-term solution—alternates are essential. The greater use of natural gas in the short-term is certain.

Cogeneration

Cogeneration has increased substantially. The most common fuel is natural gas, although automobile tires, wood shaving, walnut shells, refuse, and other exotic fuels may also be used.

Outlook and Opinion — Support from public, industry, and regulatory bodies will increase, but cogeneration, nevertheless, will supply only a small fraction of the national demand.

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Conservation

The contribution made by conservation is uncertain, for a common definition of what is considered "conservation" is lacking. For example, is reduced oil demand attributable to its higher cost considered as a credit to conservation? One credible source estimates conservation has contributed the equivalent of a 3% reduction in demand the past decade—equivalent to a couple dozen generating stations.

Virtually all utilities are expanding their conservation programs, as regulators provide utilities with incentives that allow the earning profits for investments made for conservation just like investments made for production facilities.

Outlook and Opinion — Conservation is popular with everyone, and its emphasis will increase. The limits of conservation benefits remain to be determined.

Solar and Other Renewables

Renewables include hydro, solar, wind, geothermal, tidal power, biomass, and other similar energy sources. Proponents often tout that renewables already supply 7% of the world's electrical power. But, hydroelectric is 6% out of that 7%, and three-quarters of the remaining 1% is geothermal, which, in the United States, is largely limited to California. Therefore, all remaining renewables supply a mere quarter of 1%.

The most glamorized and politicized renewable is solar. It would be almost socially unacceptable on many college campuses to question the claims of solar's merits, no matter how preposterous those claims may be. A claim such as "solar development could have eliminated the United States' dependency on Middle East oil," frequently goes unchallenged, even though it is well known that most petroleum is consumed by transportation.

Many solar applications, such as military communications, water heating, and space heating, have found very useful niches. However, central-station application has very different requirements including continuity of service, economics, and large areas of land. Practical application is still far from being feasible.

Government-funded, central-station development has been underway for years at an experimental center in Southern California. Utilities, always eager to adopt systems that have public support, have shown little inclination to plan for investments in commercial application. Equipment suppliers, usually eager to pursue any opportunity to manufacture and service thousands upon thousands of machines, such as a truly viable solar market would provide, are exiting rather than entering the solar market. Those facts obviously say something about industry's real views of central-station potential.

Outlook and Opinion — Solar's political popularity is such that it is assured of continued federal government funding for research and development, and possibly tax credits. Nevertheless, solar will not contribute significantly to central-station use in the foreseeable future.

Nuclear Power

Nuclear provides 20% of the United States' electrical power. Nuclear does not release pollutants to the atmosphere. Yet, a new nuclear plant has not ordered for 15 years. Even so, plants ordered prior to 1975 have continued to completion, and their startups accounted for more than one third of all new capacity since 1975.

Immense obstacles confront nuclear power's expansion. Many obstacles are regulatory and legal, while many others are traceable to architect-engineer, nuclear vendor, and utility practices. Public ignorance, misunderstanding, and misinformation also contribute.

In short, the situation has been, and remains, a mess. Utilities will not order nuclear plants without changes, which include:

1. *Public Pressure*

The public is accustomed to dire warnings, while ample power remains available. The attitude is "why not continue as before." A genuine sense of urgency may await more acute shortages.

2. *Recognition of Alternatives' Limitations*

Many count on the realization of exaggerated claims made for alternative energy sources, such as conservation, solar, and others. A more realistic understanding of what they can contribute is necessary.

3. *Reform of the Regulatory Systems*

Congress, the Department of Energy, and the Nuclear Regulatory Commission, among others, must promote

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stability and predictability with measures such as one-step licensing and standardization.

4. *Recognition of the Real Environmental Choice Between Nuclear and Fossil Wastes*

Environmental choices are between *releasing* the enormous volumes of uncontainable fossil waste, or *containing* very small amounts of nuclear waste. To control, or not to control, is the ultimate choice.

5. *Practical Adaptation to Siting Limitations*

In prior years plants were located with little public resistance. This resulted in over seventy nuclear sites, most of which contain only one or two plants each. Now resistance to all sites, and especially nuclear, is the rule. Far fewer future sites will be available. As each site must be fully utilized, and accommodate a number of plants, the sites will tend to become generation centers.

6. *Advancement of Nuclear Power Plant Safety*

The public wants more safety, which the industry can provide. The industry needs to proceed promptly with its safer designs.

7. *Modernizing Industry Organization*

Industry is not presently structured to implement programs required in the future. Standardized designs, integrated systems design, integrated project control, and turnkey offerings require a different organizational approach.

8. *Financial Accountability Related To Decision Accountability*

Industry will accept financial responsibility for that which it is allowed to control. But given past history, it cannot accept responsibility for decisions beyond its control. Government must protect the industry from the consequences of government actions.

Outlook and Opinion — Nuclear will gradually return. Within a few years, a demonstration plant program will materialize. Commercial ordering may resume in a decade. In the long term, future generations will insist on nuclear power, for it is an inexhaustible, environmentally beneficial energy source. The waste issue, so important today, will disappear when managed competently.

A NATIONAL ENERGY STRATEGY

Two years ago, President Bush directed the Secretary of Energy to prepare a National Energy Strategy by December of this year. Although the outcome is unknown, a program along the following lines is probable:

1. Increase the emphasis on **conservation.**
2. Continued **"clean coal"** research.
3. **Avoidance of coal** where practical.
4. **Phasing out oil** for electricity generation.
5. **Greater reliance on natural gas** in the near-term.
6. Encourage a **nuclear power plant demonstration** program adequate to maintain the nuclear option.
7. Modest increases in **research and development for renewables**: fusion, solar, and others.

I would like to see a more action-oriented program. I am concerned that the United States is working itself into a blind alley much like Sweden, and possibly others, has done.

Sweden, a high per capita user of electrical energy, has evolved a de facto energy policy piece by piece over the past 10 to 15 years. One piece was the prohibition of new hydro; another was the prohibition of increased carbon dioxide emissions; another piece was the mandated shutdown of all twelve nuclear plants (half of Sweden's current electrical supply) by the year 2010; and another was assuming conservation and renewables would compensate for lost nuclear-generated electrical capacity.

Matters have come to a head. With hydro, fossil, and nuclear prohibited; conservation insufficient, and two of Sweden's twelve nuclear plants proposed for shutdown by the mid-1990s, specific problems have to be confronted. What will be the industrial consequences of losing capacity? Who will pay for replacements, etcetera?

A decision was recently reported in which Sweden announced it will continue operation of the two nuclear plants scheduled for shutdown. The de facto policy caved in, at least partially, on the first test.

Some challenges facing Sweden are similar to those of the United States. The United States has a semi-stalemate. Several regions are already short of supply and growing shorter. New capacity requires ten years to develop. The luxury of procrastination is gone.

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SUMMARY AND CONCLUSION

Over the past 20 years, study after study of future energy needs has reached the same conclusions. Namely, the United States electrical system will have to rely mainly on coal and nuclear, and natural gas to a lesser extent, for many decades. Conservation will temper demand, but will not avoid more growth in demand. Renewables are years away.

When all the options are looked at together, not individually, as they must be for practical reasons, little has happened that changes those basic conclusions. However the implementation of practical choices has become more complicated as political influence has broadened. A couple of decades ago, electrical energy supply was a local problem, but acid rain made it a regional problem, and now global warming is making it a world problem.

Energy solutions, moreover, are further complicated by the growth of myths, especially those involving nuclear. Partly for this reason, nuclear progress will be slow for a time. An expansion of the scale that occurred 25 years ago is not expected. But, even though hampered by myths, progress can be seen, for although myths are stubborn things, realities are *even more* stubborn things. ■

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NUCLEAR INDUSTRY CALENDAR

1991	
Jan. 13-16	*Nuclear Insurance Conference* (The Peabody Hotel, Orlando, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Feb. 3-6	*Nuclear Marketing: Utility Needs in the 1990s* (Clearwater, Florida). Sponsored by the American Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Feb. 27-28	*Nuclear Safety: The Way Ahead* (SAS Royal Hotel, Brussels, Belgium). Co-Sponsored by the Belgian Nuclear Society, the British Nuclear Energy Society, and the Insitution of Nuclear Engineers. Contact: Katie Lye or Louise Coote, IBC Technical Services Ltd; 44-71-236-4080.
March 24-27	*Fuel Cycle Conference '91* (Sheraton Scottsdale Hotel, Phoenix, Arizona). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
April 8-10	*Japan Atomic Industrial Forum Annual Conference* (Tokyo, Japan). Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.
April 14-17	*INFO '91 Conference* (The Westin Hotel, Chicago, Illinois). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
April 14-18	*Third International Conference on Nuclear Fuel Reprocessing & Waste Management* (Sendai, Japan). Sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, and co-sponsored by the American Nuclear Society and the European Nuclear Society. Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.
April 22-25	*JAIF International Conference on Water Chemistry in Nuclear Power Plants* (Fukui, Japan). Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.
May 8-10	*Second International Conference on Transportation for the Nuclear Industry* (Bournemouth, United Kingdom). Co-Sponsored by the Institution of Nuclear Engineers, the European Nuclear Society, the American Nuclear Society, the Chartered Institute of Transport, and the Institution of Civil Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409
May 12-14	*World Nuclear Fuel Market Annual Meeting* (Atlanta, Georgia). Contact: Donna Cason, World Nuclear Fuel Market; 404-447-1144.
May 14-16	*Annual Meeting on Nuclear Technology '91* (Hotel & Congress Center Maritim, Bonn, Germany). Sponsored by the Kerntechnische Gesellschaft e.V. and the Deutsches Atomforum e.V. Contact: INFORUM GmbH, Congress Office JK'91, Heussallee 10, D-5300 Bonn 1, or 0228/507 223.

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1991

June 2-6	***American Nuclear Society Annual Meeting*** (Marriot Orlando World Center, Orlando, Florida). Contact: ANS Meetings Department; 708-352-6611.
June 23-26	***International Conference on Enrichment*** (The Westin Hotel, Washington, DC). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29-Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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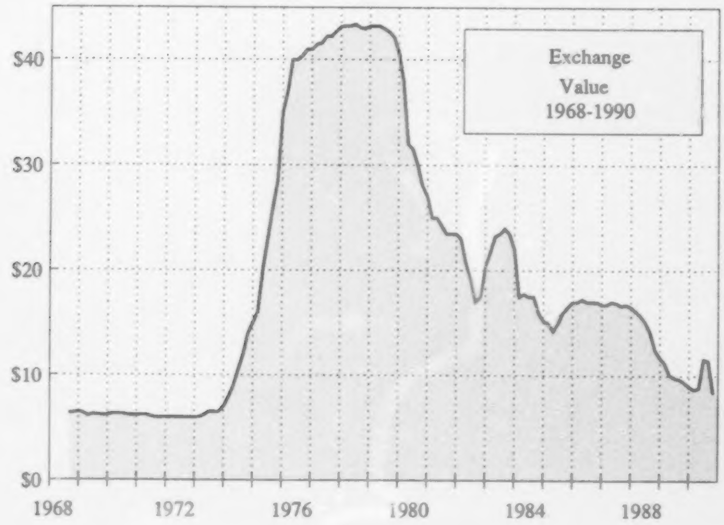
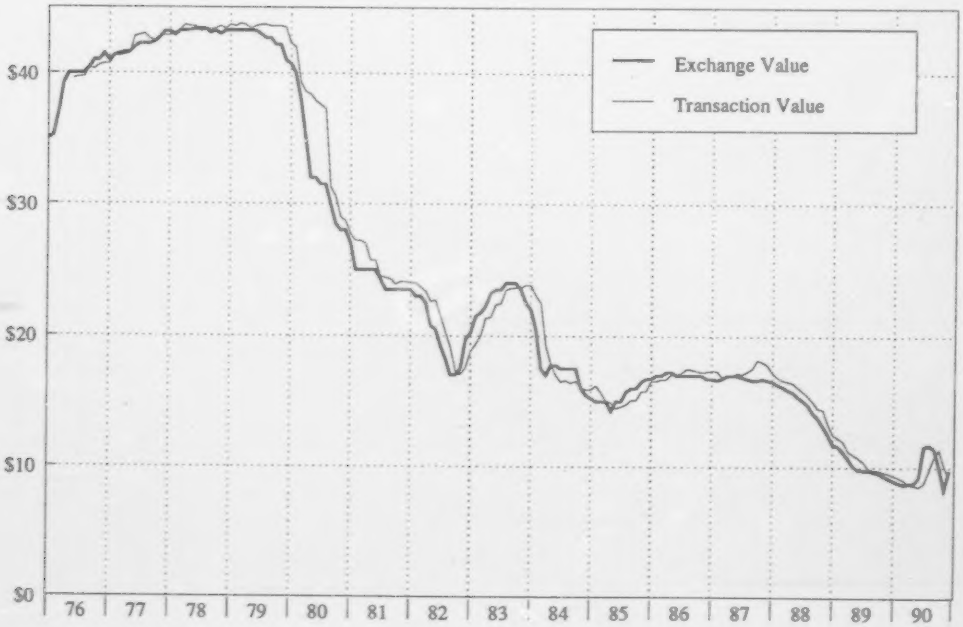
HISTORICAL MARKET DATA

NUEXCO Historical Exchange Value and Transaction Value

(In US Dollars per Pound Equivalent U_3O_8)





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HISTORICAL MARKET VALUES

EXCHANGE VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	**9.80**	

US PREMIUM (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF6 VALUES

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	**28.75**	

US UF6 PREMIUM (Relative to the UF6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

TRANSACTION VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	**9.30**	

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LOAN RATES

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**	

* Float with Prime Rate

CONVERSION VALUES

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	**1.45**	

SWU VALUES

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	**51**	

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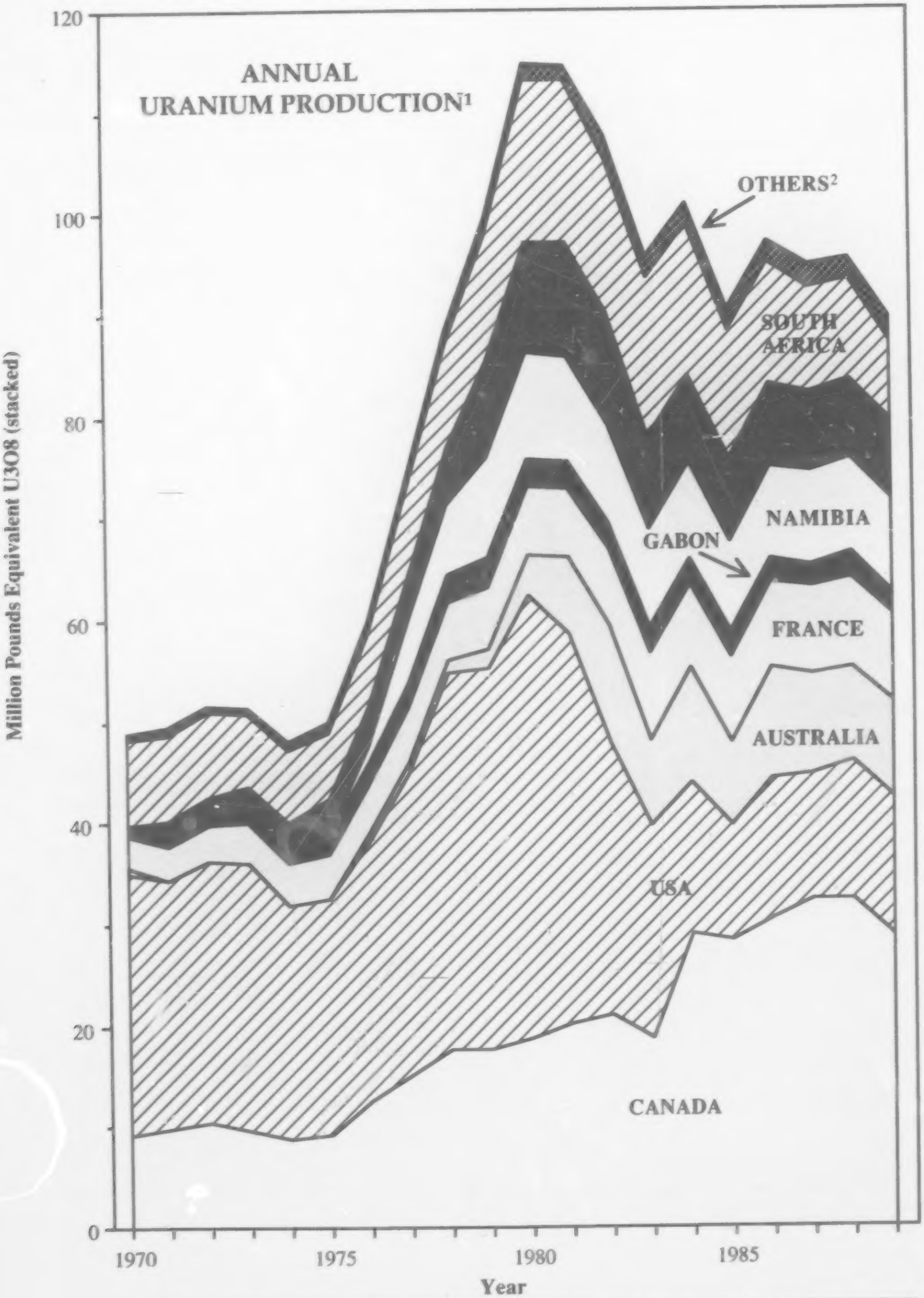

ANNUAL URANIUM PRODUCTION[1]

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Others** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, West Germany and Yugoslavia

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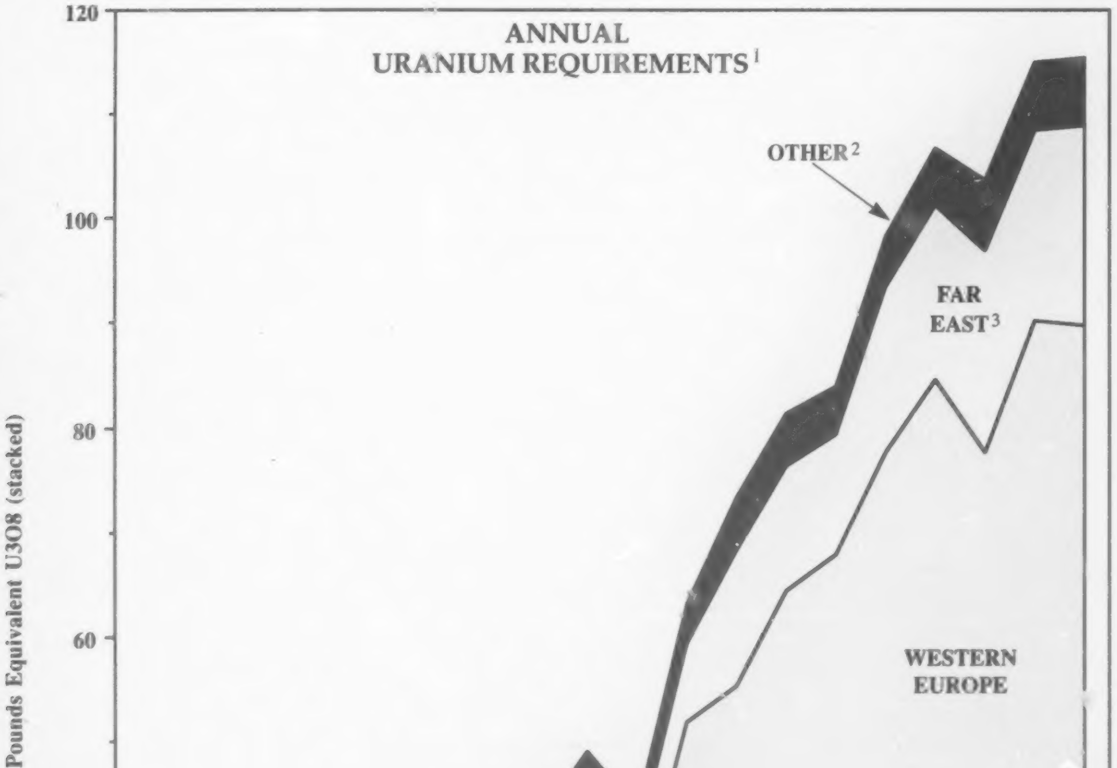

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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AUSTRALIA

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
Jan	1990	—	119.2	—	128.1 **R**
Feb	1990	—	120.8	—	128.1 **R**
Mar	1990	204.1	121.5	—	128.3 **R**
Apr	1990	—	119.9	—	128.5
May	1990	—	118.9	—	128.8 **R**
June	1990	207.4	116.6	—	129.2
July	1990	—	116.4	—	129.4
Aug	1990	—	122.4	—	129.4
Sept	1990	208.9	—	—	129.6

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 =100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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CANADA

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	—	—	—	—	—
1981	Avg.	83.4	75.5	—	—	—	—	—
1982	Avg.	89.0	83.7	—	—	—	—	—
1983	Avg.	92.1	88.5	17.22	—	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	—	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.3	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.2	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.5	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.2	119.8	23.88 **R**	20.51 **R**	18.59 **R**	14.50 **R**	15.33 **R**
Sept	1990	109.9	120.2	24.89 **P**	20.95 **P**	18.92 **P**	14.26 **P**	15.57 **P**
Oct	1990	110.3	121.2	—	—	—	—	—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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GOVERNMENT STATISTICS

SOUTH AFRICA

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	682,001	903,195
Aug	1990	—	—	206.5	199.8	—	—
Sept	1990	129.46	312.55	209.7	203.2	—	—
Oct	1990	—	—	211.1	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average for indicated year.

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GOVERNMENT STATISTICS

UNITED STATES

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.7	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.6	13.59	13.72	13.09	10.05
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.7	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2 **R**	114.3 **R**	129.9	130.9	14.00	14.31	13.51	10.27
July	1990	113.2	114.3	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27 **R**	14.60	13.57 **R**	10.33 **R**
Sept	1990	118.3	118.3	132.7	132.1	14.41 **P**	14.51 **P**	13.63 **P**	10.43 **P**
Oct	1990	121.3	120.8	133.5	—	—	—	13.76 **P**	10.45 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, D.C.: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, D.C.: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, D.C.: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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VOLUME AND PRICE OF URANIUM DELIVERIES TO THE EUROPEAN COMMUNITY[1]

(Compiled from data published by the Euratom Supply Agency)

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

R = Revised

[1] The twelve European Community member nations are Belgium, Denmark, France, West Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US URANIUM MARKETING ACTIVITIES STATISTICS
(Compiled from data published by the US Energy Information Administration)[1]

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] (\$/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	14.8	$19.14	1.0
1988	13.1	17.6	$25.65	15.8	$19.03	3.3

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*
1984-1988: Energy Information Administration, *Uranium Industry Annual*

[2] Data for 1976-1981 includes both domestic utilities and agents

[3] Includes imports by domestic utilities and domestic suppliers

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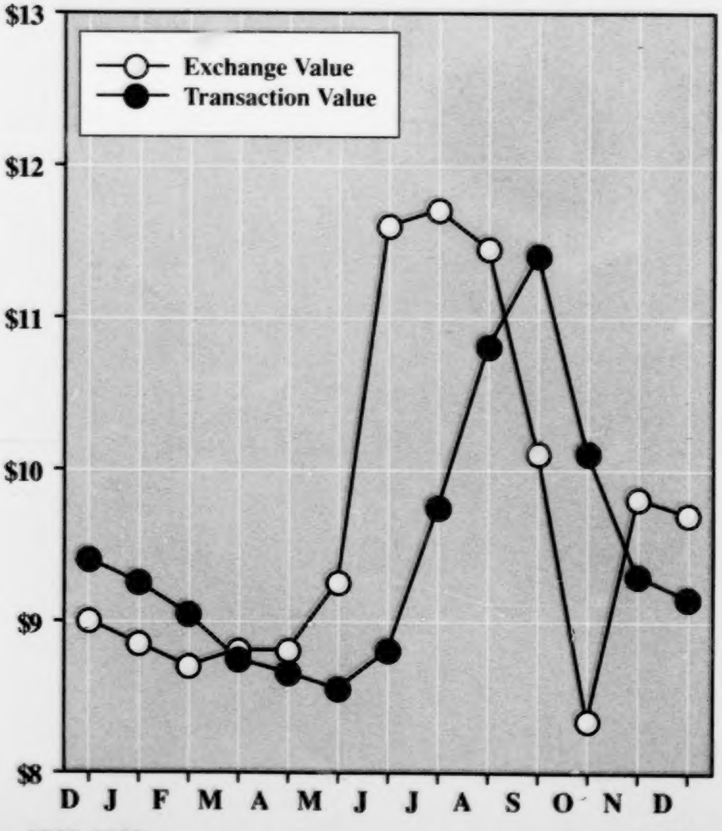

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Annual Review;
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International Directory of Uranium Producers (IDUP)

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To Our Readers

An updated, cumulative 12-year index to NUEXCO Monthly Report articles will soon be available and will be mailed to all subscribers of the Monthly Report. This convenient reference lists and cross-references all of the Monthly Report articles by subject, as well as speeches, essays, and authored articles for all Reports from 1979 through 1990.

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Market Values Summary

NUEXCO Market Values	This Report December 31, 1990	Last Report November 30, 1990	12 Months Ago December 31, 1989
EXCHANGE VALUE[1]	**$9.70**/lb equivalent U_3O_8	$9.80	$9.00
UF_6 VALUE[2]	**$28.75**/kg U as UF_6	$28.75	$26.50
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**$1.45**/lb U as UF_6	$1.45	$1.65
SWU VALUE[5] **(0.3 w/o tails assay)**	**$51**/SWU	$51	$54
TRANSACTION VALUE[6]	**$9.15**/lb equivalent U_3O_8	$9.30	$9.40
Transactions	19	16	21
Months	3	3	3
Millions of Pounds	3.1	3.0	4.2

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated, contracts or other than arm's-length transactions, are not included in the determination of these **Market Values**.
- In the determination of **Market Values**, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the **Market Values**.
- In the determination of the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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DECEMBER MARKET REVIEW

(as of December 31, 1990)

OVERVIEW

At the close of 1990, the Exchange Value slipped $0.10 from the end of November, to $9.70 per pound U_3O_8, while the UF_6 Value was unchanged at $28.75 per kgU as UF_6. Compared to the level of activity earlier in the year, December was a slower month with just over one million pounds equivalent U_3O_8 changing hands. The holiday season, low demand at year-end, and uncertainty in the market all contributed to the lower volume. However, for the year, spot market volume reached a record high of over 40 million pounds equivalent U_3O_8 (**Table 1**).

The Loan Rate, Conversion Value, and SWU Value all remained unchanged at 3.5 percent, $1.45 per pound U as UF_6, and $51 per SWU, respectively. These markets were also quieter in December, each having only one transaction reported.

NATURAL URANIUM AND CONVERSION

The uranium market softened somewhat and the **Exchange Value** declined ten cents, to **$9.70** per pound U_3O_8. Throughout December, some sellers were hesitant to offer prices above the November 30 Exchange Value, concerned that higher prices would draw additional sellers into the market. Several suppliers had indicated during November and December that they would consider reentering the market as sellers if prices rose above ten dollars per pound. But, the resistance of buyers to higher prices limited the entrance of new sellers. Several discretionary buyers withdrew from the market during December in anticipation of lower prices in the future. At least three buyers chose not to purchase any material after publicly soliciting offers.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	December 1990		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	5	0.9	68	23.9
Natural UF_6	3	0.2	36	9.7
EUP	1	≤0.1	13	7.0
Total	**9**	**1.2**	**117**	**40.6**

[1] million pounds equivalent U_3O_8

Five concentrates sales were reported for December totalling over 900 thousand pounds equivalent U_3O_8 for delivery during first quarter 1991. Prices ranged from slightly above the November 30 Exchange Value early in the month, to levels at or near the December 31 Exchange Value. Purchases by a single intermediary and two producers accounted for a large majority of the material sold in December. Four of the buyers are located in the USA,, while sellers are from Europe and the USA.

* * *

The **UF_6 Value** was unchanged at **$28.75** per kgU as UF_6. This is the first time since April 1990 that the UF_6 Value has not changed; notable because the past six to eight months have been so volatile. During December, most buyers were willing to accept either concentrates or UF_6, evaluating the economics of each offer, based upon their judgments of the uranium and conversion markets, and purchasing U_3O_8 or UF_6 accordingly. Just as with concentrates, buyers usually had multiple offers from which to choose, even for small quantities. If offered prices failed to meet the buyer's expectations, they simply elected to postpone their purchases, confident that prices would be lower in the future.

Three natural UF_6 sales were reported. Three US buyers purchased nearly 200 thousand pounds equivalent U_3O_8. All three sales called for delivery in February 1991 from the intermediary sellers. The sales were concluded at prices that ranged from below the prevailing UF_6 Value for a small quantity, to prices at or near the December 31 UF_6 Value for a larger delivery.

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Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply [1]		Active Demand [1]
• Natural Uranium [2] (thousand lbs equivalent U_3O_8)	4,400		1,895
• Supply/Demand Ratio:		2.3	
• Loan (thousand lbs equivalent U_3O_8)	9,025		0
• Conversion (thousand lbs U as UF_6)	700		465
• SWU (thousand SWUs)	200		105

[1] Supply and demand tables in the Market Review section of this Report provide details for each category.
[2] Includes concentrates and hexafluoride.

The **Transaction Value** declined $0.15, to **$9.15** per pound U_3O_8 based on 19 transactions over 3 months involving 3.1 million pounds equivalent U_3O_8. Although December's sales help boost the average, its low volume was not enough to compensate for the loss of September's higher-priced sales from the calculation. Consequently, the Transaction Value dropped slightly.

* * *

Active uranium supply dropped from 4.7 million pounds to **4.4** million pounds equivalent U_3O_8 (**Table 2**). **Active uranium demand** increased by 100 thousand pounds, to **1.9** million pounds equivalent U_3O_8. The **supply/demand ratio** slipped to **2.3**. These slight movements of supply and demand must be kept in perspective. They are only minor fluctuations when compared to the magnitude and unsettled state of the market's oversupply situation. Short-term supply/demand imbalances may affect an individual transaction, but until government stockpiles and excess utility and producer inventories are drawn down, substantial price increases will not be sustainable and it will remain a buyer's market.

Only one sale was reported in the **long-term natural uranium market**. Earlier in 1990, an Asian utility purchased several million pounds of concentrates from a producer for delivery during the period 1992 to 2001. Four utilities, two US and two European, continue to evaluate long-term offers. All four utilities received a large number of offers with a wide variety of pricing terms. The utilities are expected to make their purchase decisions during early 1991, and will likely conclude contracts with excellent terms due to the extraordinary competition among sellers.

* * *

The **Loan Rate** remains unchanged at **3.5** percent per annum. One December UF_6 loan was reported. An intermediary borrowed over 250 thousand pounds equivalent U_3O_8 from a US utility. Loan supply remains in excess of 9 million pounds equivalent U_3O_8 while no inquiries to borrow are reported.

* * *

The **Conversion Value** also remains at the same level, **$1.45** per pound U as UF_6, unchanged since February 28, 1990. One sale was reported, in which a US utility purchased conversion for over 200 thousand pounds U from an intermediary at a price near the December 31 Conversion Value for delivery during 1991.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** remained at **$51** per SWU for the third consecutive month. Secondary enrichment market activity was light in December with no real pressure upward or downward on the SWU Value. Only one transaction was reported, in which a fabricator purchased a small quantity of enriched uranium product (EUP) from an intermediary. One buyer continues to evaluate offers on a small quantity of EUP. A few additional SWU buyers are expected to request offers during first quarter 1991.

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Additionally, as the enrichment market evolves, following in the path of the natural uranium market, market participants are beginning to examine loan opportunities involving enriched uranium. Both borrowers and lenders are starting to explore opportunities to utilize some of the existing inventories of EUP. ■

NOTICE

Beginning with this report, please note that the South Korean Won and Taiwan Dollar have been added to the Market Values Expressed in Selected Currencies tables.

In the December Monthly Report (#268), the calculation of the Market Values in Swedish Krona in the Selected Currencies tables was incorrect. The correct values are shown in this month's tables under the column labled *Last Month/November 30, 1990.*

Table 3
ENRICHMENT PRICES
(December 31, 1990)

Prices	This Month Report 269	Last Month Report 268	12 Months Ago Report 257
NUEXCO SWU Value ($US per SWU)	51	51	54
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF$_6$[6]: ($US per KgU as UF$_6$)			
2.0 w/o U_{235}	205	206	204
2.5 w/o U_{235}	282	284	283
3.0 w/o U_{235}	362	364	363
3.5 w/o U_{235}	444	446	446
4.0 w/o U_{235}	526	528	529
4.5 w/o U_{235}	609	612	614

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5000	1991	Less Than 50	Below 90	Utility	Intermediary	UF_6
5005	1991	101-300	98-102	Producer	**R**	
5006	1991	Less Than 50	90-97	Utility	Intermediary	UF_6
5012	1992-2001	1,001-3,000	**R**	Utility	Producer	Occurred Earlier in 1990
5015	1991	101-300	98-102	Intermediary	Intermediary	UF_6
5016	1991	50-100	98-102	Intermediary	Intermediary	
5017	1991	Less Than 50	**R**	Producer	Intermediary	Market Related Pricing
5018A	1991	Less Than 50	**R**	Fabricator	Intermediary	Contained in EUP
5020	1991	101-300	98-102	Intermediary	Intermediary	
5022[3]	1991	301-600	**R**	Intermediary	**R**	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

[3] NUEXCO learned of this December transaction after December 31, 1990, therefore this transaction was not included in the data presented in the Monthly Market Activity Summary that was transmitted on January 1, 1991.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5019	1991	101-300	98-102	Intermediary	Utility	UF_6

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5008	1991	101-300	98-102	Utility	Intermediary	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5018B	1991	Less Than 50	**R**	Fabricator	Intermediary	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 $^{w}/_{o}$ tails assay.

[4] Prices are usually normalized to 0.30 $^{w}/_{o}$ tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale:				
ACTIVE				
90-1078A*	700	1,045 per year	1991-1993	UF_6e
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1249	700	—	1991	
90-7001	2,000	1,000 per year	1991-1995	
Total	**4,400**			
INACTIVE	**4,450**			
Available for Loan:				
ACTIVE				
88-1182	4,400	—	—	U_3O_8/UF_6
90-1016	1,000	—	—	U_3O_8
90-1108	1,000	—	—	U_3O_8
90-1180	525	—	—	U_3O_8
90-1230	1,000	—	—	U_3O_8
90-1260	1,000	—	—	UF_6
90-1275	100	—	—	U_3O_8
Total	**9,025**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1208

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Inquiries to Purchase:				
ACTIVE				
90-1100A	45	—	1991	UF_6e
90-1235B	250	—	1991	
90-1239A*	160	—	1991	UF_6e
90-1289*	210	—	1991	
90-1292*	50	—	1991	
90-1293*	200	—	1991	
90-1302*	980	—	1991-1992	
90-1170	—	290	1992-1996	
90-1226	—	1,045 per year	1992-1996	UF_6
90-1240	—	260 per year	1994-1996	U_3O_8/UF_6
90-1254A	—	250 per year	1993-1996	U_3O_8/UF_6
90-1256	—	500 per year	1994-1998	U_3O_8/UF_6
90-1291*	—	100	1991-1995	
Total	**1,895**			
INACTIVE	**2,820**			
Inquiries to Borrow	*No inquiries to borrow are reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1267, 90-1274, 90-1276
Active Projects removed since last month: 90-1182, 90-1205, 90-1271, 90-1277, 90-1281, 90-1284

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF₆)		Delivery Period	Remarks
	Within 3 Years[1]	Beyond 3 Years[1]		
Available for Sale:				
ACTIVE				
91-7000	300	—	1991	
91-7001	400	—	1991	
Total	**700**			
INACTIVE	*None reported*			
Inquiries to Purchase:				
ACTIVE				
90-1259	210	—	1991	
90-1306*	255	255 per year	1991-2002	
90-1254C	—	210	1993-1996	
Total	**465**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1264, 90-1282

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SUPPLY AND DEMAND

SWU Supply And Demand

	Quantity (Thousand SWUs)			
NUEXCO Project Number	**Spot or Near-term**[1]	**Intermediate or Long-term**[2]	**Delivery Period**	**Remarks**
Available for Sale				
ACTIVE				
90-1078B	200	435 per year	1991-93	UF$_6$e
90-7000	—	1,000	1991 on	
Total	**200**			
INACTIVE	**650**			
Inquiries to Purchase				
ACTIVE				
90-1100B	15	—	1991	UF$_6$e
90-1224	40	100 per year	1991-1995	
90-1239B*	50	—	1991	UF$_6$e
88-1061	—	500	1991-1995	
90-1076	—	350 per year	1992-1998	
90-1094	—	500	1992-2000	
90-1144	—	60 per year	1992-2001	
90-1181	—	600	1996-2003	UF$_6$e
90-1196	—	60 per year	1995 on	
90-1301*	—	1,000 per year	1995-2000	
Total	**105**			
INACTIVE	**150**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 88-1006, 90-1225

Active Projects removed since last month: *none*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Dec. 31, 1990)**	**Last Month (Nov. 30, 1990)**	**12 Months Ago (Dec. 31, 1989)**	**This Month (Dec. 31, 1990)**	**Last Month (Nov. 30, 1990)**	**12 Months Ago (Dec. 31, 1989)**
Australia (dollar)	12.58	12.70	11.33	32.71	33.02	29.44
Belgium (franc)	299.57	304.73	319.60	778.81	792.22	830.89
Canada (dollar)	11.25	11.41	10.41	29.25	29.66	27.07
EC (ecu)	7.17	7.11	7.48	18.64	18.48	19.43
Finland (markka)	35.13	35.32	36.60	91.34	91.82	94.38
France (franc)	49.32	49.81	52.08	128.23	129.49	135.40
Germany (mark)	14.50	14.76	15.23	37.70	38.38	39.60
Italy (lira)	10,922	11,088	11,390	28,395	28,828	29,610
Japan (yen)	1,309	1,307	1,296	3,402	3,399	3,370
Netherlands (guilder)	16.35	16.66	17.17	42.50	43.30	44.64
So. Africa (comm. rand)	24.88	24.55	22.83	64.68	63.82	59.34
So. Korea (won)	6,931	7,002	6,639	18,018	18,204	17,259
Spain (peseta)	927.79	935.92	985.11	2,412	2,433	2,561
Sweden (krona)	54.56	55.21	55.83	141.83	143.54	145.15
Switzerland (franc)	12.38	12.57	13.90	32.18	32.69	36.13
Taiwan (dollar)	258.36	262.09	254.41	671.69	681.37	661.42
UK (pound)	5.04	5.06	5.62	13.10	13.15	14.61
US (dollar)	9.70	9.80	9.00	25.22	25.48	23.40

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Dec. 31, 1990)**	**Last Month (Nov. 30, 1990)**	**12 Months Ago (Dec. 31, 1989)**	**This Month (Dec. 31, 1990)**	**Last Month (Nov. 30, 1990)**	**12 Months Ago (Dec. 31, 1989)**
Australia (dollar)	11.87	12.05	11.83	30.85	31.34	30.75
Belgium (franc)	282.58	289.18	333.81	734.65	751.80	867.82
Canada (dollar)	10.61	10.83	10.88	27.59	28.14	28.27
EC (ecu)	6.76	6.74	7.81	17.59	17.53	20.30
Finland (markka)	33.14	33.52	37.92	86.16	87.14	98.58
France (franc)	46.53	47.27	54.40	120.96	122.89	141.42
Germany (mark)	13.68	14.01	15.91	35.56	36.42	41.36
Italy (lira)	10,303	10,523	11,896	26,785	27,357	30,926
Japan (yen)	1,234	1,241	1,354	3,209	3,225	3,519
Netherlands (guilder)	15.42	15.81	17.93	40.09	41.09	46.62
So. Africa (comm. rand)	23.47	23.30	23.84	61.01	60.57	61.98
So. Korea (won)	6,538	6,645	6,300	16,996	17,275	16,379
Spain (peseta)	875.18	888.17	1,029	2,275	2,309	2,675
Sweden (krona)	51.46	52.39	58.31	133.79	136.21	151.60
Switzerland (franc)	11.68	11.93	14.52	30.35	31.02	37.74
Taiwan (dollar)	243.71	248.72	241.43	633.60	646.61	627.67
UK (pound)	4.75	4.80	5.87	12.35	12.48	15.26
US (dollar)	9.15	9.30	9.40	23.79	24.18	24.44

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6 This Month (Dec. 31, 1990)	per lb U as UF_6 Last Month (Nov. 30, 1990)	per lb U as UF_6 12 Months Ago (Dec. 31, 1989)	per kg U as UF_6 This Month (Dec. 31, 1990)	per kg U as UF_6 Last Month (Nov. 30, 1990)	per kg U as UF_6 12 Months Ago (Dec. 31, 1989)
Australia (dollar)	1.88	1.88	2.08	4.15	4.14	4.58
Belgium (franc)	44.78	45.09	58.59	98.72	99.40	129.18
Canada (dollar)	1.68	1.69	1.91	3.71	3.72	4.21
EC (ecu)	1.07	1.05	1.37	2.36	2.32	3.02
Finland (markka)	5.25	5.23	6.66	11.58	11.52	14.67
France (franc)	7.37	7.37	9.55	16.25	16.25	21.05
Germany (mark)	2.17	2.18	2.79	4.78	4.82	6.16
Italy (lira)	1,633	1,641	2,088	3,599	3,617	4,603
Japan (yen)	195.60	193.44	237.62	431.23	426.45	523.85
Netherlands (guilder)	2.44	2.46	3.15	5.39	5.43	6.94
So. Africa (comm. rand)	3.72	3.63	4.18	8.20	8.01	9.23
So. Korea (won)	1,036	1,036	982.25	2,284	2,284	2,165
Spain (peseta)	138.69	138.48	180.60	305.76	305.29	398.16
Sweden (krona)	8.16	8.17	10.24	17.98	18.01	22.57
Switzerland (franc)	1.85	1.86	2.55	4.08	4.10	5.62
Taiwan (dollar)	38.62	38.78	37.64	85.15	85.49	82.99
UK (pound)	0.75	0.75	1.03	1.66	1.65	2.27
US (dollar)	1.45	1.45	1.65	3.20	3.20	3.64

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Dec. 31, 1990)	SWU Value at 0.30 w/o Tails Assay Last Month (Nov. 30, 1990)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (Dec. 31, 1989)	UF_6 Value per kg U as UF_6 This Month (Dec. 31, 1990)	UF_6 Value per kg U as UF_6 Last Month (Nov. 30, 1990)	UF_6 Value per kg U as UF_6 12 Months Ago (Dec. 31, 1989)
Australia (dollar)	66.15	66.10	67.95	37.29	37.27	33.34
Belgium (franc)	1,575	1,586	1,918	887.89	893.97	941.05
Canada (dollar)	59.16	59.36	62.48	33.35	33.47	30.66
EC (ecu)	37.71	36.99	44.85	21.26	20.85	22.01
Finland (markka)	184.72	183.80	217.83	104.13	103.61	106.89
France (franc)	259.33	259.21	312.50	146.19	146.12	153.35
Germany (mark)	76.24	76.83	91.40	42.98	43.31	44.85
Italy (lira)	57,426	57,705	68,337	32,372	32,530	33,536
Japan (yen)	6,880	6,804	7,777	3,878	3,835	3,816
Netherlands (guilder)	85.96	86.68	103.01	48.46	48.86	50.55
So. Africa (comm. rand)	130.80	127.76	136.95	73.74	72.02	67.20
So. Korea (won)	36,439	36,439	34,548	20,542	20,542	19,476
Spain (peseta)	4,878	4,871	5,911	2,750	2,746	2,901
Sweden (krona)	286.84	287.32	334.99	161.70	161.97	164.39
Switzerland (franc)	65.08	65.43	83.38	36.68	36.89	40.92
Taiwan (dollar)	1,358	1,364	1,324	765.77	768.88	746.37
UK (pound)	26.49	28.32	33.73	14.93	14.84	16.55
US (dollar)	51.00	51.00	54.00	28.75	28.75	26.50

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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INDUSTRY BRIEFS

Nevada Still Challenging Yucca Mountain Repository

On December 17, the State of Nevada filed a petition to the US Supreme Court appealing the September decision of the US Court of Appeals that invalidated Nevada's actions to block DOE site characterization at the proposed Yucca Mountain national high-level waste repository. In a related case, the US District Court in Las Vegas, Nevada has postponed, until January 15, 1991, consideration of DOE's suit against Nevada (which seeks to force Nevada to act on three permit applications) to allow Nevada time to respond to a motion for summary judgement by the Department of Justice.

◆ ◆ ◆

Green Party Loses Seats In German Parliament

On December 2, in the first parliamentary election since unification, the anti-nuclear Green Party lost its 42 seats in the Bundestag (Parliament). The Green Party received only 4.8% of the vote, while 5% is the minimum to maintain representation, and therefore must give up its Bundestag offices and election funding. In the election, anti-nuclear issues appear to have taken a back seat to issues of German unification.

Ontario Hydro Must Give Millions to Opposition Groups

The Ontario Environmental Assessment Board has determined that Ontario Hydro must supply C$23 million (of C$60 million requested) to intervenor groups. The awards will fund the intervenor groups' preparation of their cases for the environmental review of Ontario Hydro's long-term energy plans.

The largest single allocation, nearly C$3 million, went to the nine-member Coalition of Environmental Groups. Indian tribes will receive almost C$8 million. Over 20% of the $23 million award will cover legal fees. The unusually large total award adds to the obstacles facing Ontario Hydro's long-term plans (which include 10 more nuclear power plants) following the anti-nuclear New Democratic Party's victory in the recent provincial election.

◆ ◆ ◆

International Nuclear Societies Form Council

The American Nuclear Society, European Nuclear Society, and nuclear organizations from seven other countries worldwide have formed the International Nuclear Societies Council (INSC). The intent in forming the INSC is to bring together professionals in nuclear energy from around the world.

PNC Transfers Interest In Midwest Project

On December 13, PNC (Power Reactor and Nuclear Fuel Development Corporation) of Japan agreed in principle to transfer its 15% interest in the Midwest Project to Overseas Uranium Resources Development Company Ltd. (OURD) of Japan. OURD is a privately-owned company, with a majority of its interests held by nine Japanese utilities and eight mining companies.

The transfer of PNC's interest as the project readies for commercial development follows PNC's charter which dictates only research, exploration, and demonstration of a project. PNC acquired its interest in the Midwest Project, located in Saskatchewan, Canada, in 1987. Other companies with interests in the project remain Denison Mines Ltd. as operator (45%), Uranerz Exploration & Mining Ltd. (20%), and Bow Valley Industries Ltd. (20%).

◆ ◆ ◆

Taiwan Power To Invest In Reno Creek ISL Project

The board of Taiwan Power Company has approved an investment in the Reno Creek in-situ leaching uranium mining project in Wyoming. Taiwan Power Company will purchase a one-third interest in the project, if government approvals are received. Exploration is continuing although development of the project is delayed until the market improves.

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NUEXCO

FOCUS

SOVIET UNION'S NUCLEAR POWER PROGRAM

Glasnost has dramatically increased the availability of information about the Soviet Union's nuclear industry. In the future, even more information is likely to become known as Soviet participation in international forums increases. Not only is much more general information now available, but up-to-date details are regularly provided, including information such as the Soviet nuclear industry's strategic direction and goals, recent reactor design changes, safety inspection results, and reports of public opposition and protest. This article summarizes the current status of the Soviet nuclear power program, reconciling the often conflicting reports from various public sources.

Program Development

In March 1986, one month before the Chernobyl accident, the Soviet Union's 15 commercial nuclear power stations operated 41 different reactors with a total generating capacity of 28,000 MWe. By late 1990, 16 stations were operating 47 reactors with a total generating capacity of nearly 34,000 MWe. Although nuclear power had grown, the program had fallen far behind schedule. In 1985, the Soviet Union had planned to double nuclear power generating capacity in five years, reaching 60,000 MW by 1990, and growing to nearly 200,000 MW by the year 2000. Current goals call for 50,000–80,000 MW of installed capacity by 2005, with expectations toward the lower end of the range.

The Soviet Union's installed electricity generating capacity (including coal, gas, oil, and nuclear) doubled between 1970 and 1987, growing faster than that of the UK, USA, West Germany, or Italy. But demand grew even faster than supply. With the Soviet Union's current energy situation, supply can barely satisfy demand. A major cause is that electricity is used so inefficiently. This leads to such high demand that intermittent shortages occur. Furthermore, public opposition to fossil fuel plants (because of environmental concerns) and to nuclear power plants have aggravated the situation.

Because of the Chernobyl accident, feelings of nationalism in the republics, and the openness now permitted in the Soviet Union, public expression of opposition to nuclear power plants has reached unprecedented levels. Protests and public pressure have led to cancellations, delays, and closures of nuclear plants in several of the Soviet republics.

Nuclear Electricity Generation

The Soviet Union is still the third-largest nuclear-generating country in the world, after the USA and France. The Soviet Union is currently operating 47 commercial power reactors with a total generating capacity of 33,810 MWe net (**Table 1**). This includes 25 VVERs (PWR type), 20 RBMKs (graphite moderated, channel type), and 2 FBRs (Fast Breeder Reactors). Ten reactors are still under construction, and the Soviet Union also has a number of nuclear-powered, district heating stations operating and under construction.

The sixteen operating nuclear power stations are located primarily in the western part of the country, where the large majority of the 280 million Soviet citizens live. The stations are located in four of the 15 different republics that make up the Soviet Union. Nine stations are located in Russia, the country's largest republic; the others are located in the Ukraine, Lithuania, and Kazakhstan (**Figure 1**). In 1989, nuclear power generated 212,600 GwH of electricity, which represents about 12.5% of the total Soviet electricity generation. The average load factor in 1989 for all of the operating nuclear plants was 69.3 percent. Two new reactors (Smolensk 3 and Zaporozhe 5) began commercial operation in the past year or so, but plans for additional reactors at many stations have been cancelled or indefinitely postponed. Several units (both operating and under construction) have been shutdown or cancelled (**Table 2**). The following updates review the status of several of the stations, including stations that are operating, under construction, or planned. The most current information on the units is included, but changes are occurring so quickly that a unit's status can often change in less than a week's time.

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Table 1
NUCLEAR POWER UNITS IN THE SOVIET UNION

Units In Operation

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]
Balakovo 1	MAEI[2]	950	VVER[3]	1986
Balakovo 2	MAEI	950	VVER	1988
Balakovo 3	MAEI	950	VVER	1989
Beloyarsk 3	MAEI	560	FBR[4]	1981
Chernobyl 1	MAEI	650	RBMK[5]	1978
Chernobyl 2	MAEI	650	RBMK	1979
Chernobyl 3	MAEI	925	RBMK	1982
Ignalina 1	MAEI	1,380	RBMK	1985
Ignalina 2	MAEI	1,380	RBMK	1989
Kalinin 1	MAEI	950	VVER	1985
Kalinin 2	MAEI	950	VVER	1987
Khmel'nitski 1	MAEI	950	VVER	1988
Kola 1	MAEI	411	VVER	1973
Kola 2	MAEI	411	VVER	1975
Kola 3	MAEI	411	VVER	1982
Kola 4	MAEI	411	VVER	1984
Kursk 1	MAEI	650	RBMK	1977
Kursk 2	MAEI	650	RBMK	1979
Kursk 3	MAEI	925	RBMK	1984
Kursk 4	MAEI	925	RBMK	1986
Leningrad 1	MAEI	650	RBMK	1974
Leningrad 2	MAEI	650	RBMK	1976
Leningrad 3	MAEI	925	RBMK	1980
Leningrad 4	MAEI	925	RBMK	1981
Novovoronezh 2	MAEI	336	VVER	1970
Novovoronezh 3	MAEI	385	VVER	1972
Novovoronezh 4	MAEI	385	VVER	1973
Novovoronezh 5	MAEI	950	VVER	1981
Rovno 1	MAEI	361	VVER	1981
Rovno 2	MAEI	384	VVER	1982
Rovno 3	MAEI	950	VVER	1987
Smolensk 1	MAEI	925	RBMK	1983
Smolensk 2	MAEI	925	RBMK	1985
Smolensk 3	MAEI	925	RBMK	1990
South Ukraine 1	MAEI	950	VVER	1983
South Ukraine 2	MAEI	950	VVER	1985
South Ukraine 3	MAEI	950	VVER	1989
Troitsk 3	MAEI	90	RBMK	1960
Troitsk 4	MAEI	90	RBMK	1960
Troitsk 5	MAEI	90	RBMK	1961
Troitsk 6	MAEI	90	RBMK	1963

(continued on next page)

[1] COD = Commercial Operation Date

[2] MAEI = Ministry of Atomic Energy and Industry

[3] VVER = Vodo-Vodyanoi Energetichesky Reaktor

[4] FBR = Liquid Metal Fast Breeder Reactor

[5] RBMK = Reaktory Bolshoi Moshchnosti Kanalnye

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Table 1
NUCLEAR POWER UNITS IN THE SOVIET UNION
(continued)

Units In Operation *(continued)*

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]
Zaporozhe 1	MAEI[2]	950	VVER[3]	1985
Zaporozhe 2	MAEI	950	VVER	1985
Zaporozhe 3	MAEI	950	VVER	1987
Zaporozhe 4	MAEI	950	VVER	1988
Zaporozhe 5	MAEI	950	VVER	1989
BN–350	SCAE[6]	135	FBR[4]	1973
Total		**33,810**		

1989 Total Electricity Generation : **212,600 GwH**

1989 Average Load Factor : **69.3%**

Units Under Construction

Unit	Lead Utility or Fuel Buyer	Capacity (MWe Net)	Type	COD[1]
Balakovo 4	MAEI	950	VVER	1992
Balakovo 5	MAEI	950	VVER	1995
Balakovo 6	MAEI	950	VVER	1998
Kalinin 3	MAEI	950	VVER	1993
Kalinin 4	MAEI	950	VVER	1995
Khmel'nitski 2	MAEI	950	VVER	1990
Kostroma 1	MAEI	950	VVER	1994
Kostroma 2	MAEI	950	VVER	1995
Kursk 5	MAEI	925	RBMK[5]	1995
Tatar 1	MAEI	950	VVER	1994
Total		**9,475**		

[1] COD = Commercial Operation Date (actual or expected)

[2] MAEI = Ministry of Atomic Energy and Industry

[3] VVER = Vodo-Vodyanoi Energetichesky Reaktor

[4] FBR = Liquid Metal Fast Breeder Reactor

[5] RBMK = Reaktory Bolshoi Moshchnosti Kanalnye

[6] SCAE = State Committee for Atomic Energy

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Table 2
NUCLEAR POWER UNITS IN THE SOVIET UNION

Units Shutdown, Cancelled, or Indefinitely Deferred

Unit	Capacity (MWe Net)	Type	COD[1]	Shut Down[2]	Year Cancelled[3]
Aktash 1	950	VVER[4]	1989c	—	1989
Aktash 2	950	VVER	1991c	—	1989
Armenia 1	376	VVER	1979	1989	—
Armenia 2	376	VVER	1980	1989	—
Azerbaijan	950	VVER	1998p	—	1988
Bashkir 1	950	VVER	1991c	—	1990
Bashkir 2	950	VVER	1992c	—	1990
Beloyarsk 1	102	RBMK[5]	1964	1983	—
Beloyarsk 2	146	RBMK	1969	1989	—
Chernobyl 4	925	RBMK	1984	1986	—
Chernobyl 5	925	RBMK	1991c	—	1989
Chernobyl 6	925	RBMK	1992c	—	1989
Georgia	950	VVER	1998p	—	1989
Ignalina 3	1,380	RBMK	1994p	—	1989
Ignalina 4	1,380	RBMK	1995p	—	1989
Khmel'nitski 3	950	VVER	1991c	—	1990
Khmel'nitski 4	950	VVER	1992c	—	1990
Khmel'nitski 5	950	VVER	2000p	—	1989
Krasnodar 1	950	VVER	1992p	—	1988
Kursk 6	925	RBMK	1996c	—	1989
Minsk 1	925	VVER	1988c	—	1988
Minsk 2	925	VVER	1991c	—	1988
Novovoronezh 1	265	VVER	1964	1988	—
Odessa 1	925	VVER	1989c	—	1988
Odessa 2	925	VVER	1990c	—	1988
Rostov 1	950	VVER	1990c	—	1990
Rostov 2	950	VVER	1992c	—	1990
Rostov 3	950	VVER	1995c	—	1990
Rostov 4	950	VVER	1996c	—	1990
Rovno 4	950	VVER	1991c	—	1990
Smolensk 4	925	RBMK	1990c	—	1989
South Ukraine 4	950	VVER	1991c	—	1990
Troitsk 1	90	RBMK	1958	1987	—
Troitsk 2	90	RBMK	1959	1987	—
Zaporozhe 6	950	VVER	1992c	—	1990
BN–800	750	FBR[6]	1996c	—	1990
BN–1600	1,500	FBR	1996p	—	1989
Total	**30,930**				

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[1] COD = Commercial Operation Date (actual or expected)
c = construction started on unit; p = unit was still in planning stage

[2] Year of shutdown if unit reached commercial operation

[3] Year when plans were cancelled or when construction was halted if unit did **not** reach commercial operation.

[4] VVER = Vodo-Vodyanoi Energetichesky Reaktor

[5] RBMK = Reaktory Bolshoi Moshchnosti Kanalnye

[6] FBR = Liquid Metal Fast Breeder Reactor

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Operating Stations

Two Reactors Begin Operation

Zaporozhe 5, a 950 MWe (net) VVER, began commercial operation late in 1989. Zaporozhe 6, which was nearly complete and scheduled to begin operation in 1991, fell victim to a recently-passed moratorium in the Ukraine. The only reactor to begin operation in 1990 was Smolensk 3, a 925 MWe (net) RBMK. This was the first RBMK reactor to start up since the Chernobyl accident. Several design changes and backfits were incorporated in the unit to improve the safety of the reactor.

Chernobyl

On August 1, 1990 the Ukraine Parliament voted 363-5 to shut down the entire Chernobyl station within five years. Units 1, 2, and 3 are still operating, while plans for units 5 and 6 had already been cancelled. How soon the station will close is still being debated. The republic wishes to start the phaseout this year, but the reality of Soviet energy needs in the near term must also be taken into account.

First Generation RBMKs Downrated

In June 1990, the State Committee for the Supervision of Safety in Industry and Nuclear Power (SINP) ordered the downrating of six, first-generation RBMK units (Chernobyl-type) to improve the safety of their operations. The 1000-MWe units were downrated to 700 MWe (gross). The reactors affected are Chernobyl 1, 2; Kursk 1, 2; and Leningrad 1, 2. This downrating will likely be temporary until planned safety improvements can be implemented.

Armenia Station

Armenia Units 1 and 2 (440-MWe VVERs) were shut down in 1989 in response to pressure from local residents fearing the safety of the plant during earthquakes. The federal government has considered restarting the plants because of a severe energy shortage in the region. However, seismic safety of the reactors is still being questioned, and local ethnic violence (Armenians versus Azerbaijanis) has caused much of the skilled labor force qualified to operate the plants to flee the area.

Novovoronezh

Units 2–5 of this five-unit station are still operating. Unit 1 was retired in 1988, after a 24-year life. Unit 2 was scheduled to be shut down during 1990, but has continued operating due to strong demand and a lack of replacement generating capacity.

Kola

Plans are being discussed to build two 950-MWe (net) units to replace the four older 411-MWe (net) VVERs as they reach the end of their useful life in the mid-1990s. No decision has yet been made, but because of the station's proximity to Finland, international relations will be given serious consideration in the planning process.

Map Legend
Soviet Operating Nuclear Power Stations

Station	Reactors
1 – Kola	■■■■
2 – Leningrad	◆◆◆◆
3 – Kalinin	■■□□
4 – Ignalina	◆◆◇◇
5 – Smolensk	◆◆◆◇
6 – Rovno	■■■□
7 – Chernobyl	◆◆◆◇◇◇
8 – Khmel'nitski	■□□□□
9 – Kursk	◆◆◆◆◇◇
10 – Novovoronezh	□■■■■
11 – Zaporozhe	■■■■■□
12 – South Ukraine	■■■□
13 – Balakovo	■■■□□□
14 – BN–350 (Shevchenko)	▮▮
15 – Troitsk	◇◇◆◆◆◆
16 – Beloyarsk	◇◇▮▮

■ = VVER in commercial operation
□ = VVER under construction
□ = VVER shutdown, cancelled, or deferred
◆ = RBMK in commercial operation
◇ = RBMK under construction
◇ = RBMK shutdown, cancelled, or deferred
▮▮ = LMFBR in commercial operation

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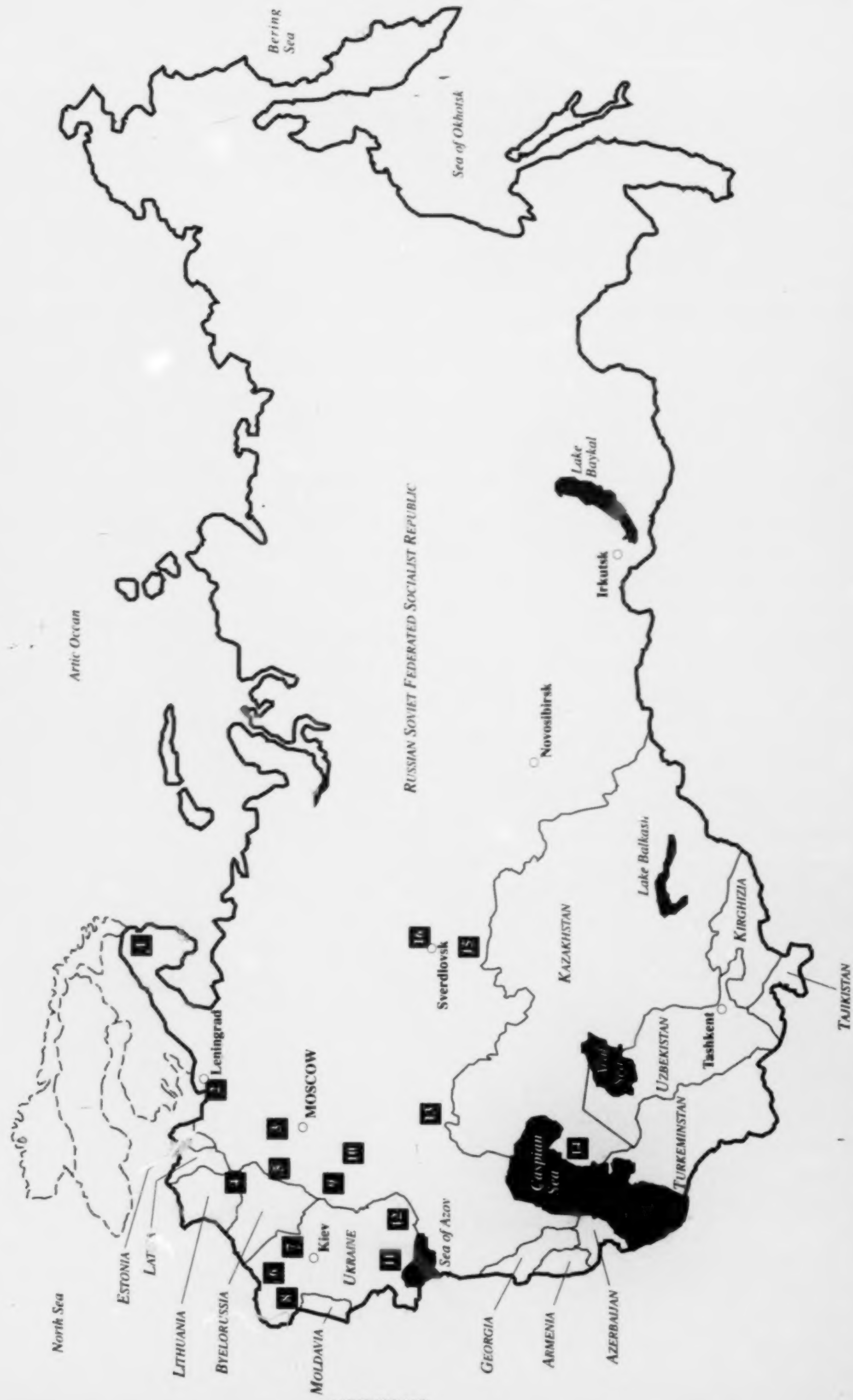
Figure 1
Operating Nuclear Power Stations in the Soviet Union


Bering Sea
Sea of Okhotsk
Artic Ocean
Lake Baykal
Irkutsk
RUSSIAN SOVIET FEDERATED SOCIALIST REPUBLIC
Novosibirsk
Lake Balkash
KAZAKHSTAN
KIRGHIZIA
TAJIKISTAN
Tashkent
UZBEKISTAN
TURKEMINSTAN
Aral Sea
Caspian Sea
Sverdlovsk
Leningrad
MOSCOW
Kiev
UKRAINE
Sea of Azov
North Sea
ESTONIA
LAT A
LITHUANIA
BYELORUSSIA
MOLDAVIA
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Units Under Construction

Ukraine Moratorium

During 1990, the Ukrainian Parliament passed a five-year moratorium, halting all plans and construction on nuclear plants in the republic. While a ruling by a republic does not take precedence over federal regulations, it can be effective because the republic provides all of the local labor and supplies necessary for construction. The Ukraine currently has 15 operating reactors at four stations with a total capacity of nearly 14,000 MWe. The moratorium has halted work at units 3, 4, and 5 at the Khmel'nitski station, Aktash 1 and 2, Rovno 4, Zaporozhe 6, and South Ukraine 4. Several of these units are virtually complete and had been scheduled to begin operation within approximately one year. Construction on Aktash 1 and 2 had been effectively stopped in 1989 due to local opposition. Following a three-year debate, the USSR Council of Ministers officially halted the Aktash projects in 1990, even though the units were complete and ready to begin operation in 1989.

Rostov

Work on the four-unit (950-MWe VVER each) Rostov station was stopped during 1990. Units 1 and 2 were under construction and expected to come on line within a year. Units 3 and 4 were in the final planning stages. Local opposition to the plants halted the project. The opposition claimed that the station was subject to the new laws that require a minimum distance of 25 km from any population center, yet the site is located only 12 km from the Russian city of Volgodonsk. The opposition also claimed numerous safety violations even before the plants were completed. Local residents expressed a willingness to tolerate heat and energy shortages as a result of the stoppage. The units are now being considered for conversion to gas–fired plants.

Bashkir Station

Four units were originally planned for the Bashkir station in Armenia. Units 1 and 2 (950-MWe VVERs) had construction halted in 1990 because it was determined that the station was located in a seismically active region.

FBRs at South Urals

Three Fast Breeder Reactors (FBR model BN–800) have been planned for a station near Chelybinsk. The project has been approved by all national authorities and work began in 1984. However, local opposition from the public has delayed the project. Regional authorities are evaluating recent environmental impact statements and public pressure has the local authorities beginning to question the project as well.

Planned Stations

Karelia

Plans to build a 6000-MWe station (6 x 1000 MWe) in the Karelia region near the Finnish border have been abandoned. The Soviet government had examined several sites in the region, but Finnish government pressure led to the cancellation of those plans before site selection.

Yaroslavl

The Ministry of Nuclear Power stopped looking for a site to locate a nuclear heat and power station at Yaroslavl, a city northeast of Moscow. Despite continual electrical shortages, local residents opposed the plant. Authorities are now considering developing plans for a coal-powered plant.

Government Commitment to Nuclear Power

The Soviet Union's nuclear program faces the same challenges of reactor safety, waste disposal, and public acceptance that face western nuclear programs. A few years ago it was unthinkable that local opposition would be able to halt construction. But since the Chernobyl accident in 1986, the government has increased its emphasis on safety at its facilities and has recently begun responding to local concerns.

The Soviet government is still firmly committed to nuclear power because it realizes the country's dire need for clean, safe energy supplies to further economic growth. The government has announced that it will no longer construct RBMK reactors, but will concentrate on building VVER–1000 reactors, with the assistance of western safety expertise.

In July 1990, a group of Soviet nuclear experts, under the leadership of Vitaly Kenovalov, Minister of Atomic Energy and Industry, met to discuss the situation. The group sent a message to President Gorbachev, the Supreme Soviet, and all governments of the republics urging the revival of the Soviet nuclear industry. The group stressed that emotional opposition is threatening a major source of power, and that nuclear power must be sustained and must play a vital role in the development of the country. ■

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REVIEW

1990 INDUSTRY DEVELOPMENTS

Africa

Namibia Gains Independence From South Africa

On March 21, Namibia gained its independence from South African rule. The South West Africa People's Organization (SWAPO) won the majority of the votes, and named Sam Nujoma as President. The Namibian constitution establishes the country as a sovereign republic, founded on the principles of democracy. Namibia also became the 160th member of the United Nations and accepted the 50th membership in the Commonwealth of Nations.

Sanctions Lifted From Namibia

With its independence from South Africa established on March 21, countries viewed Namibia as separate from South Africa, and its apartheid social structure. Therefore, the US and Canada immediately removed anti-apartheid sanctions against Namibia. US President Bush issued a statement revoking sanctions and establishing diplomatic relations, and stated "We welcome Namibia as a full trading partner and are taking steps to ensure that it is given access to the American market." Canada lifted its ban on new contracts for uranium conversion of Namibian material.

Namibia Seeks Uranium Sales in Japan

The Namibian Trade Minister was in Japan in late October seeking to promote the sale of Namibian uranium. He visited the Secretary General of the Japanese Energy Bureau and several Japanese utilities. The Energy Bureau stated that Japan's expanding nuclear programs would offer new supply opportunities. Namibia will be setting up an office in Tokyo to pursue such sales opportunities.

UK Eases Sanctions Against South Africa

In February, the United Kingdom became the first country to loosen anti-apartheid sanctions against South Africa, when a voluntary ban on new investments in South Africa was lifted. The US is retaining its sanctions until the all five of its criteria for lifting sanctions have been met. Three had been met by the end of the year, and the other two showed significant progress.

Freegold Production Suspended

As of September 30, Freegold suspended uranium production at its Joint Metallurgical Scheme in South Africa. Rising costs and falling uranium prices were cited at the deciding factors for the suspension.

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Australia

Events Suggest Policy Changes

Events in October indicate possible changes in, or the interpretation of, the federal government's uranium policy, particularly its three mines policy. Among the events were:

- The Industry Commission's findings that the development of uranium mines should be decided by commercial interests, and that there is no clear rationale for the three mines policy.
- The aggregate purchase, by three ERA shareholders (North Broken Hill Peko Ltd., Cogema, and Rheinbraun AG) of more than 31% of Pancontinental Mining Ltd. This was likely a strategic move so that ERA is positioned to pressure Pancontinental to sell or share control of its huge Jabiluka deposit, if and when the government's uranium policy is changed.
- The Australian Minister of Environment stated that she could support uranium mining in environmentally sensitive areas, if strict environmental standards were met.

General Atomics Buys Beverley Mine

General Atomics (GA) concluded an agreement in August to purchase the Beverley uranium property from TMOC Resources, a subsidiary of Australia Gas Light Company. GA's long-term objective is to develop the property (an estimated 30 million pounds equivalent U3O8, at an average in-situ grade of 0.27%), subject to market conditions and Australian government approval.

This acquisition is GA's first step in expanding its front-end fuel cycle activities. GA already owns the Sequoyah Fuels Corporation, a US uranium conversion business located in Gore, Oklahoma.

QML Sells Uranium Stockpile

QML (Queensland Mines Ltd.) reached an agreement in May to sell its 6.5 million pound uranium inventory and associated sales contracts to a Nukem GmbH of Germany.

Europe

Uranium Mines Close

Cogema closed its Ecarpière uranium mine at Getigne and suspended activities at Piriac, early in 1990. Cogema also announced that the Chardon-en-Loire and La Commanderie operations would be closed by the end of 1990, and that the concentrates plant operated by Cogema's subsidiary, Société Industriele des Minerais de l'Ouest, will be closed in 1991.

Wismut AG, based in East Germany, announced in September that its mining operations, consisting of six uranium mines and one mill, would be closed by 1995. Wismut is an East German and Soviet uranium producing partnership (50%-50%) that was formed in 1954.

The Yugoslavian republic of Slovenia halted production at the Zirovski vrh uranium mine and mill in October. The mine and mill were officially closed in December following a parliamentary review of the economic feasibility of the Zirovski operation.

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Europe (continued)

Glencar Exploration of Ireland Enters Joint Venture with Hungary's Mecsek

In November, Glencar Exploration, plc. of Ireland entered into a joint-venture agreement with Hungary's Mecsek Ore Mining Company. Glencar, as a major joint-venture partner, and will redevelop and manage the Pecs uranium mine near the Yugoslavian border. Glencar replaces Mescek as the mine's operator. Two of the three Pecs mines are already mined out; the remaining mine has an annual production of approximately 500 MTU in concentrates.

Nuclear Reactor Shutdowns, Delays, and Moratoriums

- **Poland**'s government voted on September 4 to abandon work on the two Zarnowiec 440-MWe (net) VVERs, and to suspend any further nuclear projects until the year 2000, though nuclear power is still planned for the future. The Zarnowiec reactors, started in 1982, were only 30% complete and were plagued with economic and technical problems.
- **Swiss** voters, on September 23, rejected a proposal for the progressive abandonment of nuclear energy (which provides 40% of Swiss electrical production). However, the voters did approve another initiative which called for a 10-year moratorium on new nuclear plant licensing and construction.
- The **Italian** government, in September, ratified a July 12 resolution of the Italian Parliament that called for the permanent closure of ENEL's (Ente Nazionale per l'Energie Electrica) Trino Cercellese and Caorso nuclear power plants. The government will ultimately reimburse ENEL for the decommissioning costs.
- The **Spanish** government announced in May the permanent closure of the Vandellos 1 nuclear unit, shut down in October 1989 following a fire. The decision was based on high repair and modernization costs.
- The **Czechoslovakian** government also announced in May the delay of the completion date for the Temelin-1 and -2 1,000-MWe VVER nuclear units. The two Soviet PWRs will be backfit with Western safety technology, causing a two-year delay in the completion dates to 1994.
- **Sweden** continues to undergo conflict and dissension over the 1980 mandate to phase out nuclear power. Public polls now show the public may not want to phase out nuclear power, and many party members do not support party policy on the nuclear phase-out issue. None of the five parties have formed useful alliances on the issue, while a number of parliamentary motions have been passed that impose a virtual gridlock on the energy source options to replace nuclear. It is unlikely that any party will try to force decisions on the phaseout deadline before the national parliamentary elections in September 1991, because the dramatic consequences of implementing any of the currently available options would polarize voters, jeopardizing that party's success in the election. This political jockeying makes it unlikely that the schedule to initiate the phaseout of the first two reactors in 1995 will be met.

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Europe (continued)

Foratom Accepts Czechoslovakia, and Invites Soviet Observers –Hungary Forms New Society

Foratom announced September 4 that Czechoslovakia would become Foratom's first East European member. Foratom already included 13 West European members in its non-governmental association of national nuclear forums. Foratom also invited representatives from the Soviet nuclear community to observe Foratom's November 26 meeting in Prague.

Members of the recently-formed Hungarian Nuclear Society (HNS) were also invited to the November Foratom meeting. Hungary will not seek membership in Foratom, because Hungary decided to focus its energies in a single body and formed the HNS.

US, Hungary and Czechoslovakia Agree on Uses of Nuclear Power

US, Hungarian, and Czechoslovakian officials, meeting in September in Vienna, Austria, agreed to cooperate in the safe and peaceful uses of nuclear power. Thus, US equipment suppliers will be permitted to supply substantially more equipment to the Hungary and Czechoslovakia than previously allowed.

Unification Spurs Consolidation of German Electric Utilities

On October 3, Germany officially became one country again, after 45 years of division. On August 22, West Germany's electric utilities signed a contract with the East German government establishing the basic plan for restructuring East Germany's electricity supply industry. The three largest electric utilities in West Germany, Bayenwerk AG, Preussenelecktra AG, an RWE AG agreed to acquire a majority interest in most of East Germany's electricity production and distribution. However, these three utilities have chosen not to assume responsibility for the East German nuclear power plants. The three utilities are forming a number of new companies to own and operate the non-nuclear electricity production and the 15 regional electricity distribution areas. The government retains an interest in each of these companies, which it is allowed to sell to other investors.

Ellweiler Uranium Processing Plant Being Decommissioned

Ellweiler, the sole uranium processing plant in western Germany is being decommissioned. The plant's license was suspended May 31, 1989 due to radon gas emissions from mill tailings that were above maximum allowed levels. Gewerkschaft Brunhilde GmbH owns the Ellweiler facility near Trier, and will perform the decommissioning.

VEW Signs Reprocessing Contract with BNFL

In April, Vereinigte Elektrizitätswerke Westfalen AG (VEW) became the first German utility to sign a long-term reprocessing contract with British Nuclear Fuels plc. (BNFL) following the 1989 cancellation of the Wackersdorf reprocessing plant in western Germany.

Germany Purchases Nukem Plant for Plutonium Storage

In July, the West German Federal Government expressed its intention to purchase Nukem's fuel fabrication plant to store up to 2.5 tons of plutonium.

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Europe (continued)

RWE Acquires Greater Interest in Nukem after Reorganization

In June, RWE AG of Germany bought Degussa AG's 35% interest in Nukem, boosting its interest in Nukem to 90%. Metallgesellschaft of Germany retains the remaining 10% minority interest. This transaction continues the consolidation and reorganization of the German nuclear industry following the government's investigation of Transnuklear-Hanau (a Nukem subsidiary) in 1987.

In January, RWE announced that the company's name had officially been changed to RWE AG, from the former name of Rheinisch-Westfälische Elecktrizitätswerke AG, and had reorganized with RWE AG acting as a holding company for nearly 150 companies, arranged under five sub-divisions.

CGE Agrees To Relinquish Control of Framatome

In November, CGE (Compagnie Générale d'Electricité; a French Energy conglomerate) agreed to sell 8% of its 52% interest in Framatome S.A. (the French nuclear engineering and construction company) to state-controlled companies, which will now own 56%, for the sum of approximately FF650 million (US$130 million). Both Framatome and the French government wanted Framatome state-controlled, and used numerous legal challenges to force CGE to relinquish the majority position it gained early in 1990 by buying the French firm Dumez's 10% interest.

French Nuclear Facility Updates

- Cogema's **La Hague UP3** fuel reprocessing center became fully operational on August 26. Cogema had contracts for approximately 7,000 MTU of reprocessing—nominal capacity is 800 MTU per year.
- **Chinon A3**, Electricité de France's (EdF) oldest reactor, was closed on June 15. The 500-MWe GCR unit had operated for 24 years and produced 31.5 billion kwH. Only two operating GCRs remain in France—Bugey 1 and St. Laurent A2. Both are scheduled for decommissioning in 1992.
- The **Melox** mixed-oxide (MOX) fuel fabrication plant received its operating license on May 21. Located at Marcoule, France, the plant has been under construction since 1989, and should be completed in early 1994. It will have an annual capacity of 120 MT of heavy metal, though the license currently limits production to 100 MT of heavy metal per year. The US$250 million Melox plant will process much of the plutonium from the La Hague plant into MOX fuel assemblies.
- EdF announced in May plans for **seven new 1,400 MWe nuclear plants**. EdF plans to begin construction of one per year, starting in 1993, if project funding is received from the government. EdF cited increasing electricity sales, strong economic growth in France, and a number of long-term electricity export contracts as the reason for the expansion plans. A French government study announced in early February that nuclear power would provide the cheapest source of electricity for France into the 21st century.

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Europe (continued)

Cogema Signs Reprocessing Contracts For 15 German Reactors

At a July 9 press conference, Cogema Chairman Jean Syrota announced the signing of contracts with 11 (West) German utilities for the reprocessing of nuclear fuel during 2001 through 2015. The quantities reprocessed should approximate one-half of the total West German market.

Belgium's Utilities Merge

Belgium's primary utilities—Urerg, Intercom, and Ebes—announced in January their planned merger, with the purpose of improving their competitive position in the approaching European Community in 1992. The new entity ranks as Belgium's second largest industrial firm, and will operate the country's seven nuclear reactors.

British To Sell PowerGen to Public and Tax Fossil Fuels For Nuclear

On August 23, Energy Secretary John Wakeham indicated that the British government had decided to revert to its original plan to sell PowerGen (one of Britain's two non-nuclear electricity-generating companies) to the public, rather than to Hanson PLC, a private firm. The decision was based on the better expected value of the public sale, which could raise in excess of £1.1 billion.

Secretary Wakeham had also announced, in February, that the government would place a 10.6% tax on fossil fuel sales. This "nuclear tax" requires area electricity distribution companies to buy a total of 8,000 MW of the higher-priced nuclear-generated electricity through 1997-98.

Far East

China To Accelerate Nuclear Program

In June, China National Nuclear Corporation (CNNC) released plans to accelerate China's nuclear power program to alleviate its energy shortage. By the year 2000, nuclear generating capacity should reach 6,000 MWe, and an additional 6,000 MWe should be under construction. China's first nuclear power plant, a 300-MWe PWR at Qinshan, is scheduled to enter operation in 1991.

Japan's Kashiwazaki Kariwa-2 Begins Commercial Operation

On September 28, Tokyo Electric Power Company (TEPCO) brought its 13th nuclear power unit, the 1,045 MWe (net) BWR Kashiwazaki Kariwa–2, into commercial operation. It is Japan's 39th commercial reactor and brings the nation's installed nuclear capacity to 30,341 MWe (net).

Japan To Build 40 Nuclear Power Plants

According to a June 5 announcement by the Ministry of International Trade and Industry (MITI), Japan will add 40 nuclear power plants in the next 20 years. Japan's 39 operating plants supply almost ten percent of the country's electricity. MITI forecasts a 38-percent growth in Japan's electricity demand between 1988 and 2010. Since the announcement, some Japanese utilities have expressed doubt that this number of plants can be built in this period. They cite a markedly increased level of public opposition to proposed locations for new nuclear facilities.

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Far East (continued)

Japan's Enrichment Progress

In October, Japan Nuclear Fuel Industries (JNFI) completed the construction of the centrifuge enrichment plant at Rokkasho, at the northern tip of Honshu, Japan's largest island. The plant is scheduled to begin operation in late 1991, with an initial capacity of 150 thousand SWU per year. JNFI plans to expand the capacity to 600 thousand SWU by 1994.

The Laser Atomic Separation Engineering Research Association, referred to as LASER-J, announced on May 14 the completion of an experimental laser-enrichment plant at the Tokai Research Establishment. The plant is designed to produce 1,000 SWU per year using the same process that the US DOE's AVLIS (Atomic Vapor Laser Isotope Separation) plans to use. The experimental plant was built to confirm the technical feasibility of the process. By September, the plant had already achieved 5% enrichment with approximately one-tenth of energy required for a typical gas diffusion plant, and confirmed the commercial feasibility of the process. A production scale experiment is proceeding based on these results, and further tests are expected to achieve at least a 65% U^{235} recovery rate.

Japan's Socialist Party Supports Nuclear Energy

In an abrupt policy reversal, Japan's Socialist Party (JSP) publicly announced in April that it supports nuclear power—pending the development of an acceptable alternative. The JSP, the government's largest opposition group, recommended that the government:

- allow existing nuclear power plants to operate, but permit no new nuclear plant construction.
- accelerate R&D efforts for alternative energy sources.
- gradually phase out existing nuclear power plants and replace them, when possible, with an "improved" energy mix.

Latin America

Mexico Studying Construction of 20 New Nuclear Plants

As a result of dwindling oil supplies, Mexico initiated technical studies for 20 additional nuclear power plants. As of August, these studies were proceeding despite the fact that Mexico's Laguna Verde-1 took 15 years and over $3 billion to complete, and Laguna Verde-2 is the country's only other reactor approved or under construction.

Soviet Union and Argentina to Cooperate in Breeder Program

Argentina and the Soviet Union signed a nuclear cooperation agreement in Moscow on October 25. With the influx of Soviet expertise, a 2010 target date has been set for bringing a joint Argentine and Brazilian breeder reactor on line. Argentina will supply the plutonium fuel by reprocessing the spent fuel from its Atucha-1 reactor at its Ezeiza reprocessing plant, while Brazil will provide the sodium moderator. All Soviet/Argentine transfers will be covered by IAEA safeguards.

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Latin America (continued)

Argentina's Atucha-1 Nuclear Power Plant Reenters Service

Argentina's Atucha-1, a 335-MWe PHWR, reentered service on January 10 after being down nearly a year and a half for repairs.

German Loans Revive Atucha-2

Argentina's government has obtained a US$133 million loan in November from a consortium of German banks, and has indicated that work will resume on the Atucha-2 nuclear station (692 MWe net) in 1991. The loans, which were contingent on Argentina supplying matching funds, were first offered in 1988 and are guaranteed by the German government. Argentina's government had considered abandoning the Atucha-2 project unless financing could be found. By the government's estimate, cost overruns have pushed the completion cost to US$1.4 billion—a figure that is 90% of original estimate for the entire construction of Atucha-2.

North America

Canadian Uranium Mine Ownership Changes

- Minatco Ltd. now owns a 100% interest in the **Wolly Project** in Northern Saskatchewan. Minatco is an affiliate of the French firm Compagnie Française des Pétroles. Minatco increased its 33% share in November by purchasing the interest held by the project's former joint-venture partners, Canadian Occidental Petroleum Ltd. and Canadian Nickel Company Ltd.
- On July 25 in Bonn, Germany, Cameco completed a C$160 million sale to Uranerz Exploration and Mining, Ltd. of a one-third interest in Cameco's **Rabbit Lake Mill, and Collins Bay and Eagle South** deposits. Uranerz is a subsidiary of Uranerzbergbau GmbH, based in Bonn. Uranerz already shared an interest with Cameco in the Key Lake facilities and Eagle North deposits.
- On December 13, Power Reactor and Nuclear Fuel Development Corporation (PNC) of Japan agreed in principle to transfer its 15% interest in the **Midwest Project** to Overseas Uranium Resources Development Company Ltd. (OURD) of Japan. OURD is a privately-owned company, with a majority of its interest held by nine Japanese utilities and eight mining companies. PNC acquired its interest in the Midwest Project, located in Saskatchewan, in 1987. Other companies with interests in the project remain Denison Mines Ltd. as operator (45%), Uranerz Exploration and Mining Ltd. (20%), and Bow Valley Industries Ltd. (20%).

Rio Algom Closes Quirke and Panel, Denison Cuts Elliot Lake Production

Rio Algom announced in late July that it was closing the Quirke and Panel uranium mines in Canada. Rio Algom submitted applications to the Atomic Energy Control Board for decommissioning licenses for the mines. Denison Mines Ltd. announced in August that it was reducing the production rate at its Elliot Lake site to 2.7 million pounds equivalent U_3O_8 per year from the previous rate of 4.3 million pounds per year.

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North America (continued)

McArthur Lake Deposit Estimated As One of the World's Largest

On May 30, Cameco announced that expectations of a large, high-grade uranium deposit had been confirmed at the McArthur Lake P2 North site in the Athabasca Basin in Saskatchewan, Canada. In November, Cameco announced that further tests at the site had revised the initial estimates, and the McArthur Lake P2 North deposit was now estimated to have reserves of 200 million pounds equivalent U_3O_8, at an in-situ grade of approximately $4\,^{w}/_{o}$, which ranks this uranium deposit as one of the top two or three in the world. Timing of the development of the McArthur River Joint Venture will depend on the world market and other considerations such as nearby mill capacity. The joint venture is owned by Cameco (44%; operator), Uranerz Exploration and Mining Ltd. (29.4%), AGIP Resources Ltd. (10%), Interuranium Canada Ltd. (9.1%), Cogema Canada Ltd. (6.5%), and Imperial Metals Corp. (1.0%).

Nova Scotia Uranium Exploration Ban

In March, the Canadian province of Nova Scotia extended its moratorium on uranium exploration for five more years. The moratorium was originally imposed by the provincial government in 1981.

Saskatchewan Revises Uranium Royalty System

The Saskatchewan Ministry of Energy and Mines announced a new royalty system, retroactive to July 1, 1989, which assesses a 5-percent royalty on gross sales and a profit-related royalty. The profit-related royalty is incremental from 15 to 50 percent, increasing as profits increase. It can be applied against the minimum 5% royalty on gross sales. The previous system assessed royalties derived from return on investment percentages.

New Ruling Party In Ontario Hinders Ontario Hydro's Long-Term Plans

The left-wing, anti-nuclear New Democratic Party (NDP) won the majority of seats in the September 6 election in Canada's Ontario province, and took office on October 1 with NDP leader Bob Rae as premier. The NDP is acting on its campaign promises—just two months after taking office, the NDP placed a moratorium on more nuclear plants, and ordered Ontario Hydro to cancel all advanced engineering work on its 10-plant nuclear power plan. The moratorium does not affect the planning or construction at the Darlington station. In a separate event a few weeks later, the Ontario Environmental Assessment Board directed Ontario Hydro to supply C$23 million to fund intervenor groups cases at the environmental review of Ontario Hydro's long-term energy plans.

Canada Modifies Nuclear Export Policies

In May, the Canadian Ministry of Energy, Mines and Resources revised its upgrading policy on exports of uranium from Canada. Upgrading exemptions will be granted if "the uranium will be converted or enriched or consumed in the USA." The previous policy inferred that uranium had to be converted and enriched in the USA. The new policy clarifies the interpretation of the upgrading policy as it applies under the US–Canada Free-Trade Agreement.

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North America (continued)

US Uranium Mining Updates

- The **Rosita Project**'s in-situ leaching uranium mine began operation September 4. The Rosita Project (formerly known as the Rogers Project) is owned by Uranium Resources, Inc. (URI) and is located 60 miles west of Corpus Christi, Texas. The project has 6.2 million pounds equivalent U_3O_8 reserves, and expects to produce about 800,000 to 1,000,000 pounds annually.
- Ferret Exploration received its permit to proceed with in-situ leach mining at the **Crow Butte Project** from the Nebraska Department of Environmental Control in April. Production from the site near Crawford, Nebraska is scheduled to begin in 1991.
- Umetco Minerals Corporation announced on November 8 the temporary cessation of mining activities at the **La Sal**, **Sunday**, and **Dove Creek** sites in Colorado and Utah. The White Mesa mill was put on standby in October.
- Energy Fuels announced late in November the temporary shutdown of its **Kanab North** mine in Northern Arizona.
- Chevron Resources ceased mining and production at its **Mount Taylor** mine in New Mexico on January 12. Later in 1990, the mine was permanently closed. The mine was the last operating uranium mine in New Mexico—twelve years ago there were 55 mines operating.
- Pinnacle West Corporation sold **Malapai Resources Company** of Phoenix, Arizona to a subsidiary of Electricité de France (EdF), in a joint venture with a subsidiary of TOTAL Compagnie Française des Petroles of France, in the latter half of 1990. Included in the purchase are the Malapai uranium properties of **Irigaray** and **Christensen Ranch** in Wyoming, and **El Mesquite** in Texas. The complex transaction is structured through a new company formed by new subsidiaries of EdF and TOTAL. After multiple levels of ownership, Total Minerals is the operator of Malapai, and Malapai still exists as a legal entity.
- On March 22, **U.S. Energy**, its subsidiary **Crested Corporation**, and **Kennecott Corporation** agreed to a restructured joint-venture agreement for the development of uranium properties in Wyoming. The first development will be at **Green Mountain**. Kennecott is now equal partners with U.S. Energy and Crested, providing $15 million to develop properties and $50 million to fund uranium mine development.
- Taiwan Power Company (Taipower) will purchase a one-third interest in the **Reno Creek** in-situ leaching uranium project, if government approvals are received. The board of directors of Taipower approved the investment in December. Exploration is continuing at the project, although project development will be delayed until the market improves.
- **Rio Algom Mining Corp.** purchased approximately 25% of **Uranium Resources Inc.** (URI) in June. The private transaction involved over nine million shares.

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North America (continued)

US Nuclear Reactor Updates

- Philadelphia Electric Company's **Limerick** 2 unit entered commercial operation on January 8, eight months ahead of schedule.
- Texas Utilities Electric Company's (TUEC) controversial **Comanche Peak 1** unit received its full-power operating license on April 16. The NRC's unanimous approval came twelve years after the operating license application was submitted. Concerns over quality assurance caused the long delay.
- The **Seabrook** Nuclear Power Plant in New Hampshire began commercial operation in late August. Public Service of New Hampshire, the lead owner, received the full-power operating license on March 1. It is the USA's 111th nuclear power plant, and took 17 years to bring to operation from the time of application for the construction license, due to innumerable legal complications.
- Oregon citizens voted on November 6 to keep Portland General Electric's (PGE) **Trojan** nuclear plant in operation. The defeated measure sought to close the 1,095 MWe (net) PWR until the federal government opened a spent fuel repository. One reason the voters rejected the measure is that, by PGE estimates, replacement costs for Trojan's generating capacity could have reached $3 billion over 20 years.
- In August, Ebasco Services and CEGA, Inc. each won $1.5 billion DOE design contracts for **tritium reactors** to replace DOE's Savannah River facility. The two companies beat out Westinghouse's design by having simpler refueling, and using proven technologies.

New US Joint Ventures

- After three years of negotiations, Consumers Power Co. agreed in August to sell a 55% interest in its Palisades nuclear power plant to Westinghouse Electric Co. and Bechtel Power Co. The three companies will form a partnership, Palisades Generating Co., to own and operate the plant as an independent power producer. Consumers will manage the plant and purchase its output.
- In November, Babcock & Wilcox (B&W) and General Atomics (GA) formed a joint venture, named Triso, to produce fuel and perform related services for modular high-temperature, gas-cooled reactors, such as in the DOE's new production reactor (NPR) program. Triso, a 50%-50% partnership, will be located in Lynchburg, Virginia.
- Isotope Technologies, Inc. (ITI) announced on August 20 the formation of a joint-venture with Cameco and Agra Industries, Ltd., both of Saskatoon, Saskatchewan, Canada. The new venture called CRISLA Technologies, is also based in Saskatoon, and will use ITI-developed CRISLA technology (chemical reaction by isotope selective laser activation). The new company hopes to build a commercial-scale 1,000–SWU module by 1992, and once that module verifies the process, add further modules to attain a capacity of 100,000 SWU/year. Long-term plans are for a capacity of 250,000-500,000 SWU/year.

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North America (continued)

President Bush Signs Radiation Victim Compensation Act

US President Bush signed into law in October legislation that sets up a $100 million fund for victims of radiation from the US nuclear defense programs. Individuals who lived near Nevada defense sites and miners producing uranium for the government's defense programs in the 1940s to 1960s, and who contracted any of 12 types of cancer known to be associated with materials used in those nuclear defense programs, are eligible to receive up to $50,000 compensation.

Nevada and DOE Battle Over Yucca Moutain HLW Repository

DOE selected Yucca Mountain, Nevada as the most likely location to store the country's high-level waste (HLW), and intended to perform site characterization studies in 1989. Nevada blocked DOE by not issuing three necessary State permits, and the Nevada legislature took further actions to prohibit HLW storage in the state. On January 25, DOE filed suit against the State of Nevada for non-issuance of the permits. The US District Court in Las Vegas, Nevada postponed consideration of the DOE's permits suit until January 15, 1991 to allow Nevada time to respond to a motion for summary judgement by the Department of Justice. Meanwhile, on September 19, the 9th US Circuit Court of Appeals in San Francisco, California ruled that the Nevada legislature's actions were not binding on the US Government, and therefore the DOE could proceed with the studies. The State of Nevada filed a petition on December 17 to the US Supreme Court appealing the Circuit Court's decision.

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NUCLEAR INDUSTRY CALENDAR

1991

Jan. 13-16 *Nuclear Insurance Conference* (The Peabody Hotel, Orlando, Florida).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Feb. 3-6 *Nuclear Marketing: Utility Needs in the 1990s* (Clearwater, Florida).
Sponsored by the American Nuclear Society.
Contact: ANS Meetings Department; 708-352-6611.

Feb. 10-13 *Nuclear Energy and the 102nd Congress: Building Bridges for a Stable Regulatory Framework*
(The Boca Raton Resort and Club, Boca Raton, Florida).
Sponsored by the American Nuclear Energy Council.
Contact: ANEC; Fax: 202-488-1813; Address: ANEC, 410 First St. SE, Washington, DC 20003.

Feb. 27-28 *Nuclear Safety: The Way Ahead* (SAS Royal Hotel, Brussels, Belgium).
Co-Sponsored by the Belgian Nuclear Society, the British Nuclear Energy Society, and the Insitution of Nuclear Engineers.
Contact: Katie Lye or Louise Coote, IBC Technical Services Ltd; 44-71-236-4080.

March 24-27 *Fuel Cycle Conference '91* (Sheraton Scottsdale Hotel, Phoenix, Arizona).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 *Japan Atomic Industrial Forum Annual Conference* (Tokyo, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 14-17 *INFO '91 Conference* (The Westin Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 14-18 *Third International Conference on Nuclear Fuel Reprocessing & Waste Management* (Sendai, Japan).
Sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, and co-sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 22-25 *JAIF International Conference on Water Chemistry in Nuclear Power Plants* (Fukui, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

May 8-10 *Second International Conference on Transportation for the Nuclear Industry*
(Bournemouth, United Kingdom).
Co-Sponsored by the Institution of Nuclear Engineers, the European Nuclear Society, the American Nuclear Society, the Chartered Institute of Transport, and the Institution of Civil Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

May 12-14 *World Nuclear Fuel Market Annual Meeting* (Atlanta, Georgia).
Contact: Donna Cason, World Nuclear Fuel Market; 404-447-1144.

May 14-16 *Annual Meeting on Nuclear Technology '91* (Hotel & Congress Center Maritim, Bonn, Germany).
Sponsored by the Kerntechnische Gesellschaft e.V. and the Deutsches Atomforum e.V.
Contact: INFORUM GmbH, Congress Office JK'91, Heussallee 10, D-5300 Bonn 1, or 0228/507 223.

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CALENDAR

1991

June 2-6	***American Nuclear Society Annual Meeting*** (Marriot Orlando World Center, Orlando, Florida). Contact: ANS Meetings Department; 708-352-6611.
June 23-26	***International Conference on Enrichment*** (The Westin Hotel, Washington, DC). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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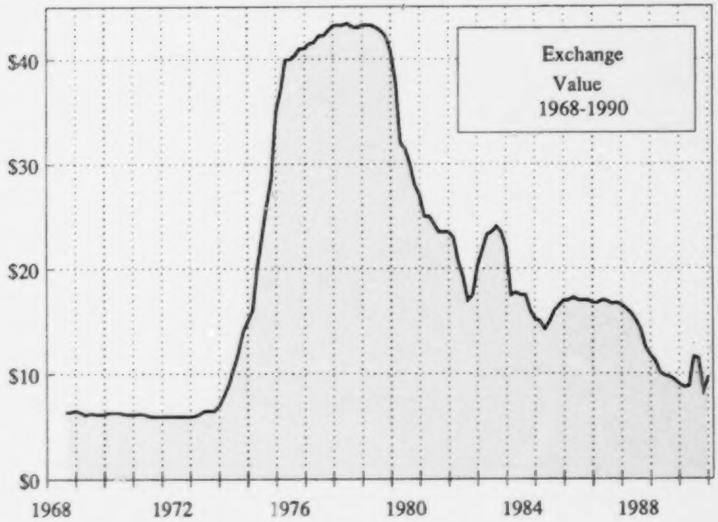
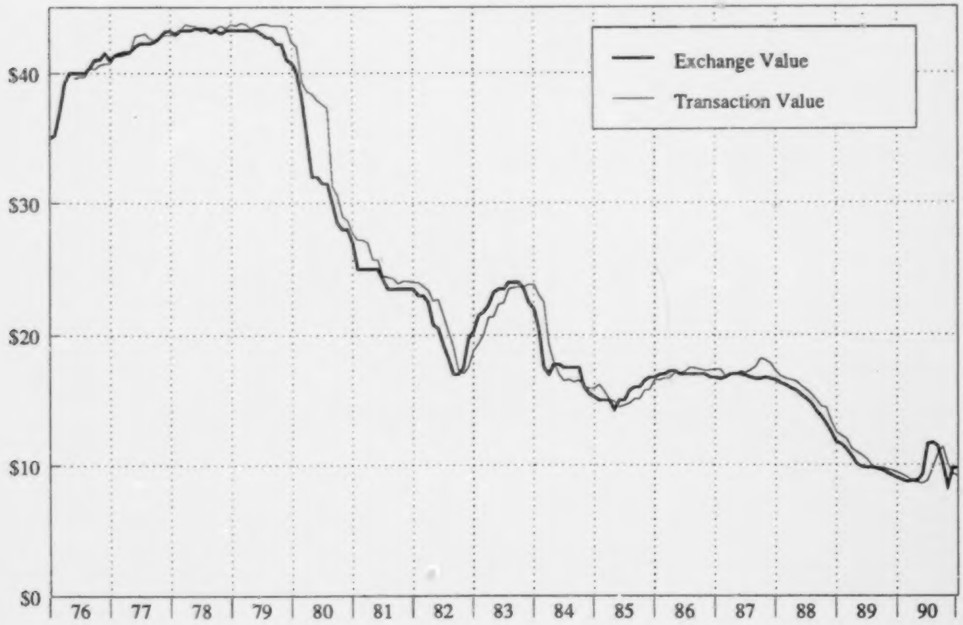
NUEXCO Historical Exchange Value and Transaction Value

(In US Dollars per Pound Equivalent U_3O_8)





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HISTORICAL MARKET VALUES

EXCHANGE VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	**9.70**

US PREMIUM (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF_6 VALUES

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	**28.75**

US UF_6 PREMIUM (Relative to the UF_6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

TRANSACTION VALUES

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	**9.15**

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LOAN RATES

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**

* Float with Prime Rate

CONVERSION VALUES

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	**1.45**

SWU VALUES

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	**51**

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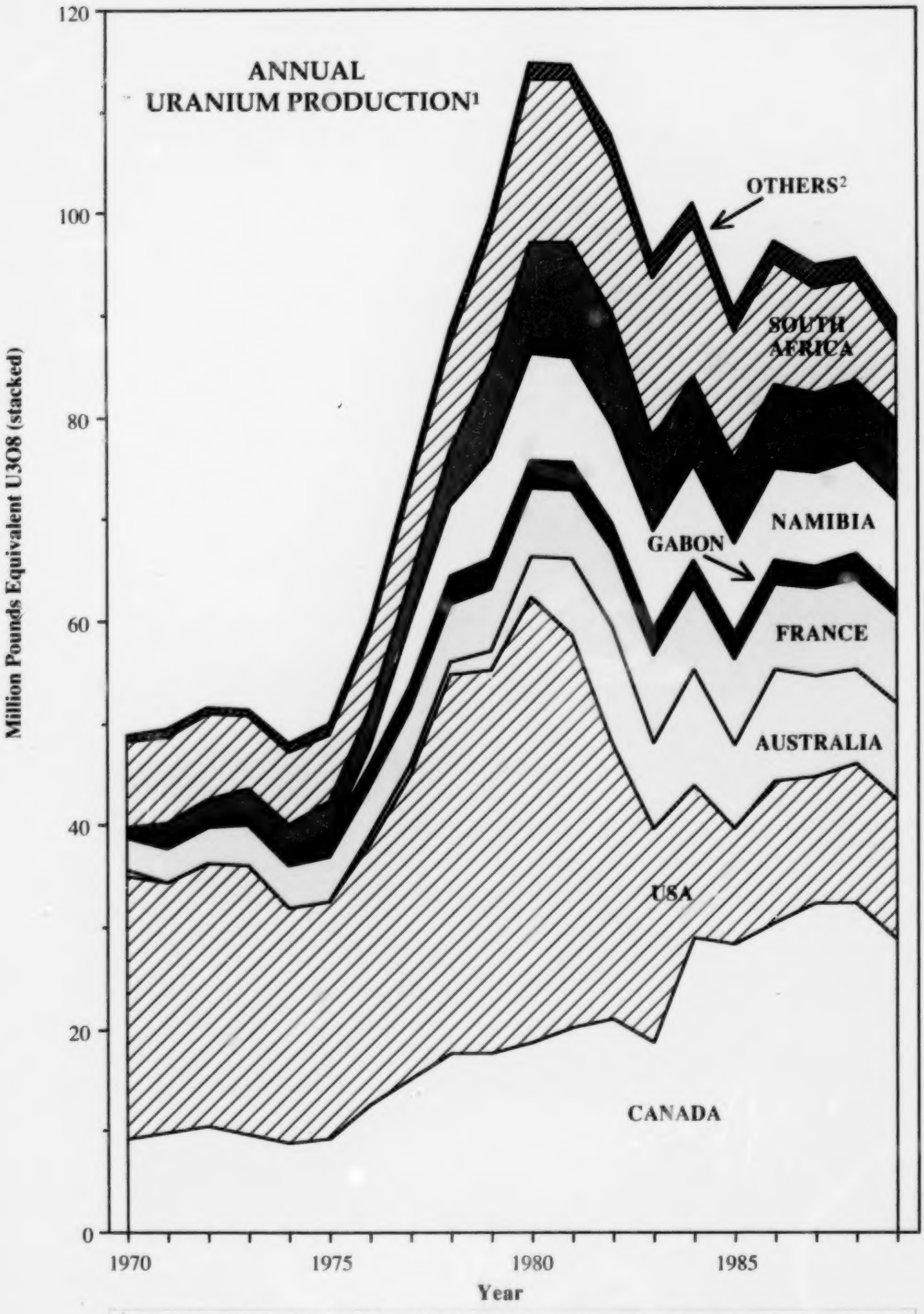

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[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Others** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, West Germany and Yugoslavia

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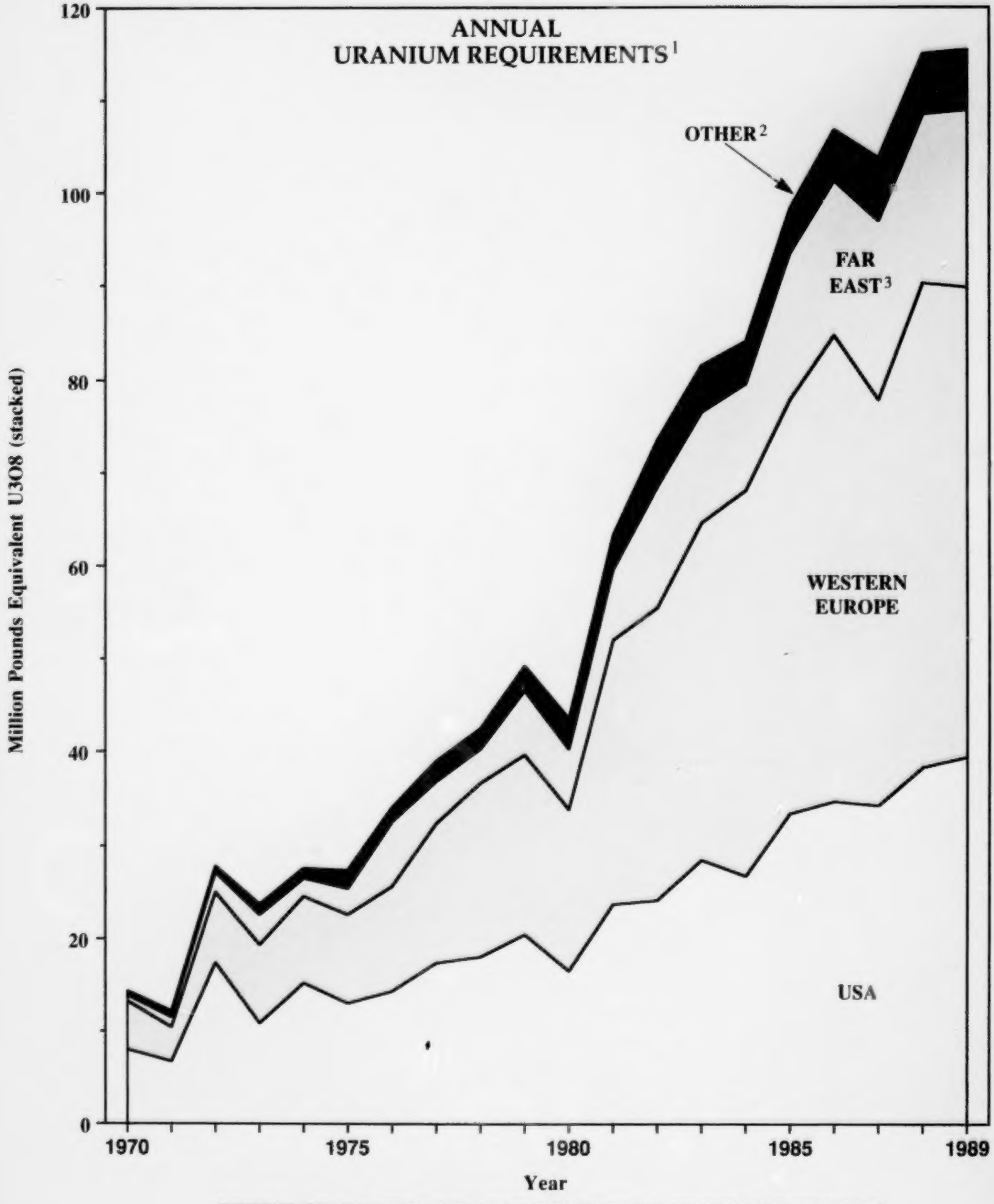
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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AUSTRALIA

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
Jan	1990	—	119.2	—	128.1
Feb	1990	—	120.8	—	128.1
Mar	1990	204.1	121.5	—	128.3
Apr	1990	—	119.9	—	128.5
May	1990	—	118.9	—	128.8
June	1990	207.4	116.6	—	129.2
July	1990	—	116.4	—	129.4
Aug	1990	—	122.4	—	129.4
Sept	1990	208.9	128.2	—	129.6

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).
[6] Base: June 1976 = 100.

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GOVERNMENT STATISTICS

CANADA

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	—	—	—	—	—
1981	Avg.	83.4	75.5	—	—	—	—	—
1982	Avg.	89.0	83.7	—	—	—	—	—
1983	Avg.	92.1	88.5	17.22	—	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	—	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.14	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.3	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.2	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.5	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.2	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	109.9	120.2	24.41 **R**	21.19 **R**	18.94 **R**	14.48 **R**	15.63 **R**
Oct	1990	110.3	121.2	23.11 **P**	21.16 **P**	19.04 **P**	14.77 **P**	15.45 **P**
Nov	1990	110.6	121.9	—	—	—	—	—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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SOUTH AFRICA

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	682,001	903,195
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	—	—
Oct	1990	—	—	211.1	206.1	—	—
Nov	1990	—	—	215.6	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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UNITED STATES

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3 **R**	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3 **R**	13.59	13.72	13.09	10.05
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5 **R**	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0 **R**	14.00	14.31	13.51	10.27
July	1990	113.4 **R**	114.5 **R**	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.3	118.3	132.7	132.2 **R**	14.41	14.48 **R**	13.62 **R**	10.42 **R**
Oct	1990	121.3	120.8	133.5	—	14.43 **P**	14.59 **P**	13.74 **R**	10.47 **R**
Nov	1990	120.6	120.1	133.8	—	—	—	13.79 **P**	10.52 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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US URANIUM MARKETING ACTIVITIES STATISTICS
(Compiled from data published by the US Energy Information Administration) [1]

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] (\$/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1 **R**	\$19.14	1.0
1988	13.1	17.6	\$26.15 **R**	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*
1984-1989: Energy Information Administration, *Uranium Industry Annual*

[2] Data for 1976-1981 includes both domestic utilities and agents

[3] Includes imports by domestic utilities and domestic suppliers

VOLUME AND PRICE OF URANIUM DELIVERIES TO THE EUROPEAN COMMUNITY[1]

(Compiled from data published by the Euratom Supply Agency)

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

R = Revised

[1] The twelve European Community member nations are Belgium, Denmark, France, West Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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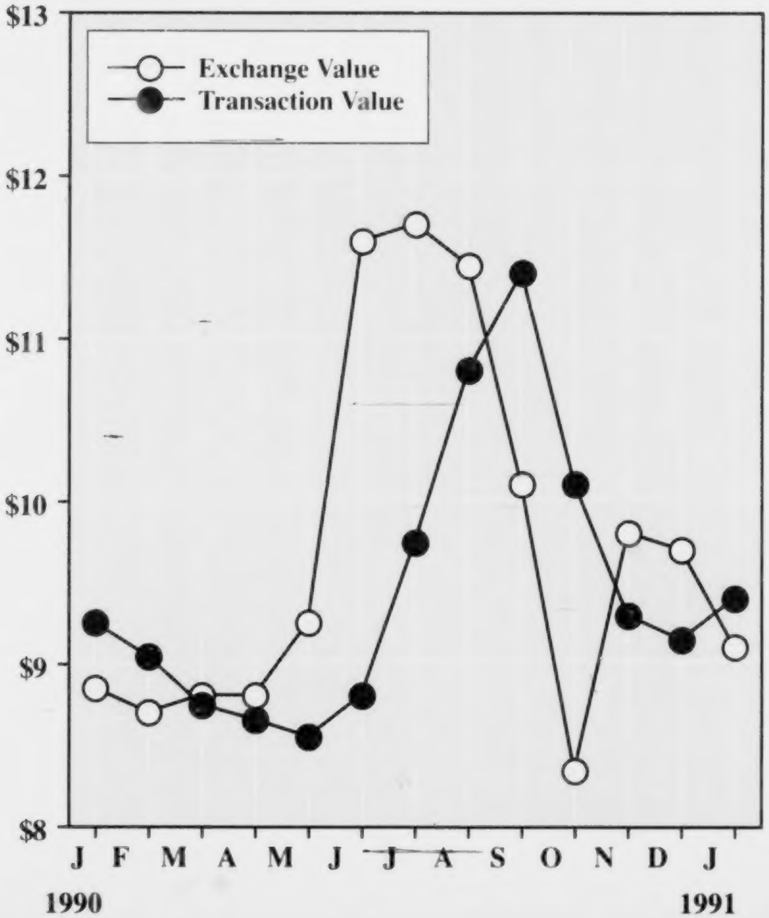

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To Our Readers

We would like to draw your attention to the revised mailing address of the Denver headquarters of CONCORD and NUEXCO. The suite number has been changed to Suite 1000, although the former address of suite 900 is still valid and mail sent to the old address will still be received. The new complete address is given below and is also included on the front inside cover.

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* * *

We are pleased to announce that CONCORD, under the name of CONCORD Resources, Ltd., has opened a new office in London as of February 1, 1991. Mr. Berwyn Edwards will serve as the Office Director of Operations, coordinating the affairs of the various CONCORD Business Units. The address is given below.

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The personnel of CONCORD Resources, Ltd., which include our NUEXCO Commercial Representatives formerly located in Geneva, will represent various CONCORD Business Units including the Nuclear Fuel Cycle Business Unit (NUEXCO). NUEXCO's two principal trading entities will continue to be located in Denver (NUEXCO Trading Corporation) and Zurich (NUEXCO Exchange AG in Olten, Switzerland).

* * *

NUEXCO is also pleased to announce that Chris von Christierson has joined the CONCORD organization on January 1, 1991 as an Executive Director, where he will have an executive role in CONCORD's world-wide operations. Chris, who has represented NUEXCO in South Africa for more than fifteen years, will be based in CONCORD Resources, Ltd.'s London office, and will also remain actively involved in Africa as CONCORD's Area Director of Operations.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report January 31, 1991	Last Report December 31, 1990	12 Months Ago January 31, 1990
EXCHANGE VALUE[1]	**$9.10**/lb equivalent U_3O_8	$9.70	$8.85
UF_6 VALUE[2]	**$27.50**/kg U as UF_6	$28.75	$25.90
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**$1.45**/lb U as UF_6	$1.45	$1.50
SWU VALUE[5] **(0.3 $^{w}/_{o}$ tails assay)**	**$51**/SWU	$51	$54
TRANSACTION VALUE[6]	**$9.40**/lb equivalent U_3O_8	$9.15	$9.25
Transactions	**18**	19	17
Months	**3**	3	3
Millions of Pounds	**3.1**	3.1	4.0

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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JANUARY MARKET REVIEW

(as of January 31, 1991)

OVERVIEW

The January 31, 1991 Exchange Value fell $0.60, to $9.10 per pound U_3O_8. The UF_6 Value also dropped, falling $1.25, to $27.50 per kgU as UF_6. Both markets declined early in the month and then stabilized in the last half of the month near their January 31 Market Values. Five near-term natural uranium sales were reported for a total of nearly one million pounds equivalent U_3O_8. January 1991's volume seems low compared to 1990's total sales volume which exceeded 40 million pounds, but January has typically been one of the least active months. The average monthly sales volume of the previous three Januarys (1988-1990) is approximately 900 thousand pounds equivalent U_3O_8.

The Conversion Value, Loan Rate, and SWU Value all remained unchanged, at $1.45 per pound U as UF_6, 3.5 percent per annum, and $51 per SWU, respectively.

NATURAL URANIUM AND CONVERSION

The **Exchange Value** declined six percent, to **$9.10** per pound U_3O_8. Twice in the latter half of 1990, market prices rose suddenly, only to be followed by equally sharp declines. During January, sellers competed aggressively early in the month, but grew increasingly cautious as prices approached the nine dollar level late in the month. Observing this pattern of declining prices, some buyers delayed their market entry in an attempt to time their purchases with a price bottom.

Five near-term natural uranium sales were reported for January, totalling slightly less than one million pounds equivalent U_3O_8. Sales prices ranged from slightly below December 31, 1990 Market Values to levels at or near the January 31, 1991 Market Values. All five buyers (four of which were utilities) were from the USA. At least four of the five sellers were from the USA as well; the fifth seller is unknown.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	January 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	3	0.5	3	0.5
Natural UF_6	2	0.5	2	0.5
EUP	0	0.0	0	0.0
Total	**5**	**1.0**	**5**	**1.0**

[1] million pounds equivalent U_3O_8

* * *

The **UF_6 Value** also declined, falling four percent, to **$27.50** per kgU as UF_6. The concentrates market and UF_6 market continued to move in parallel as buyers were generally receptive to offers of either form, although there was a small premium for UF_6 compared to the sum of the values of its components. Total near-term natural uranium sales volume was about equally split between UF_6 and concentrates.

* * *

The **Transaction Value** rose $0.25, to **$9.40** per pound U_3O_8 based on 18 transactions over 3 months involving 3.1 million pounds equivalent U_3O_8. The higher-priced sales of December and early January contributed to the increase in the Transaction Value.

* * *

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	5,200	1,600
• Supply/Demand Ratio:	3.2	
• Loan (thousand lbs equivalent U_3O_8)	10,565	0
• Conversion (thousand lbs U as UF_6)	920	630
• SWU (thousand SWUs)	650	495

[1] Supply and demand tables in the Market Review section of this Report provide details for each category.

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Active uranium supply increased from 4.4 million pounds to **5.2** million pounds equivalent U$_3$O$_8$ (**Table 2**). **Active uranium demand** decreased slightly, to **1.6** million pounds equivalent U$_3$O$_8$. As a result, the **supply/demand ratio** climbed to **3.2**.

* * *

Only one sale was reported in the **long-term natural uranium market**. A US utility purchased one million pounds equivalent U$_3$O$_8$ for delivery during the period 1993-1996.

* * *

The **Loan Rate** for natural uranium remained unchanged at **3.5** percent per annum. Two loans, totalling 1.5 million pounds equivalent U$_3$O$_8$, were reported in January. For the first time, reported loan supply now exceeds 10 million pounds equivalent U$_3$O$_8$ (**Table 2**). No inquiries to borrow are reported. Demand for loans remains low and with such an abundance of supply, any loan demand that does emerge is filled almost immediately.

* * *

The **Conversion Value** was also unchanged, remaining at **$1.45** per pound U as UF$_6$ for the eleventh consecutive month. Three conversion sales were reported in January for a total exceeding 1.5 million pounds U as UF$_6$. Two utilities made spot purchases, while the other sale calls for intermediate-term delivery.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** remained at **$51** per SWU. Despite only one secondary enrichment transaction being reported in January, in which a US utility purchased a very small quantity of SWU from an intermediary, the SWU market is more active than it has been in nearly a year. At least seven utilities have, either formally or informally, requested offers for potentially over 500 thousand SWU for near–term delivery. The long-term SWU market has also been fairly active with three utilities seeking long-term offers for a portion of their requirements. Although ample SWU supplies are available to fill this demand, the direction of the SWU market will be determined by the willingness of suppliers to sell at current market prices, and the timing of this new demand.

Table 3
ENRICHMENT PRICES
(January 31, 1991)

Prices	This Month Report 270	Last Month Report 269	12 Months Ago Report 258
NUEXCO SWU Value ($US per SWU)	51	51	54
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF$_6$[6]: ($US per KgU as UF$_6$)			
2.0 w/o U$_{235}$	198	205	201
2.5 w/o U$_{235}$	274	282	279
3.0 w/o U$_{235}$	352	362	359
3.5 w/o U$_{235}$	431	444	440
4.0 w/o U$_{235}$	512	526	523
4.5 w/o U$_{235}$	593	609	607

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5026	1991	Less Than 50	103-110	Utility	Convertor	UF_6
5032	1991	Less Than 50	103-110	**R**	Intermediary	
5036	1991	101-300	103-110	Utility	Producer	
5037	1991	301-600	98-102	Utility	Intermediary	UF_6
5041	1991	101-300	98-102	Utility	Intermediary	
5043	1993-96	601-1,000	See Remarks	Utility	**R**	Price Related To Market

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5038	1991	601-1,000	98-102	Producer	Utility	
5040	1991	301-600	98-102	Intermediary	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5025	1991	101-300	R	Utility	Intermediary	Occurred in 1990
5034	1991-92	1,001-3,000	R	R	Convertor	
5042	1991	101-300	98-102	Utility	Intermediary	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5035	1991	Less Than 50	R	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

	Quantity (Thousand Pounds equivalent U_3O_8)			
NUEXCO Project Number	Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale:				
ACTIVE				
90-1078A	700	1,045 per year	1991-1993	UF_{6e}
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1249*	500	—	1991	
90-7001*	3,000	1,000 per year	1991-1995	U_3O_8/UF_6
Total	**5,200**			
INACTIVE	**4,100**			
Available for Loan:				
ACTIVE				
88-1182	4,400	—	—	U_3O_8/UF_6
90-1016	1,000	—	—	U_3O_8
90-1108	1,000	—	—	U_3O_8
90-1180	525	—	—	U_3O_8
90-1230	1,000	—	—	U_3O_8
90-1260	1,000	—	—	UF_6
90-1275	100	—	—	U_3O_8
91-1007*	780	—	—	U_3O_8
91-1009*	260	—	—	U_3O_8
91-1018*	500	—	—	U_3O_8
Total	**10,565**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
Inquiries to Purchase:				
ACTIVE				
90-1100A	45	—	1991	UF_{6e}
90-1239A	160	—	1991	UF_{6e}
90-1267*	100	—	1991	
90-1293	200	—	1991	
91-1003A*	750	—	1991	UF_{6e}
91-1010A*	85	—	1991	UF_{6e}
91-1013*	250	—	1991	
91-1029A*	10	—	1991	UF_{6e}
90-1170	—	290	1992-1996	
90-1240	—	260 per year	1994-1996	U_3O_8/UF_6
90-1256	—	500 per year	1994-1998	U_3O_8/UF_6
90-1291*	—	100 per year	1991-1995	
91-1014A*	—	6,800	1992-2001	UF_{6e}
91-1017*	—	300 per year	1995-2000	
TOTAL	**1,600**			
INACTIVE	**3,355**			

Inquiries to Borrow *No inquiries to borrow are reported*

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1289
Active Projects removed since last month: 90-1226, 90-1235B, 90-1254A, 90-1292, 90-1302

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years [1]	Beyond 3 Years [1]	Delivery Period	Remarks
Available for Sale:				
ACTIVE				
91-1033*	220	—	1991	
91-7000	300	—	1991	
91-7001	400	—	1991	
TOTAL	**920**			
INACTIVE	*None reported*			
Inquiries to Purchase:				
ACTIVE				
91-1003C*	630	—	1991	
Total	**630**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1254C, 90-1259, 90-1306

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
Available for Sale:				
ACTIVE				
88-1006*	150	—	1991	
90-1078B	200	435 per year	1991-1993	UF_6e
91-1008*	150	—	1991	
91-1032*	150	—	1991	
90-7000	—	1,000	1991 on	
Total	**650**			
INACTIVE	**500**			
Inquiries to Purchase:				
ACTIVE				
90-1100B	15	—	1991	UF_6e
90-1224	40	100 per year	1991-1995	
90-1239B	50	—	1991	UF_6e
91-1001*	75	—	1991	
91-1003B*	170	—	1991	UF_6e
91-1010B*	20	—	1991	UF_6e
91-1023*	60	120	1991-1995	
91-1025*	60	—	1991	
91-1029B*	5	—	1991	UF_6e
90-1076	—	350 per year	1992-1998	
90-1094	—	500	1992-2000	
90-1144	—	60 per year	1992-2001	
90-1181	—	600	1996-2003	UF_6e
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	
91-1014B*	—	1,770	1992-2001	UF_6e
91-1027*	—	55 per year	1996-2000	
91-1028*	—	125	1995-1996	
Total	**495**			
INACTIVE	**150**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 88-1061

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Jan. 31, 1991)**	**Last Month (Dec. 31, 1990)**	**12 Months Ago (Jan. 31, 1990)**	**This Month (Jan. 31, 1991)**	**Last Month (Dec. 31, 1990)**	**12 Months Ago (Jan. 31, 1990)**
Australia (dollar)	11.59	12.58	11.58	30.14	32.71	30.10
Belgium (franc)	280.09	299.57	313.27	728.16	778.81	814.44
Canada (dollar)	10.57	11.25	10.52	27.47	29.25	27.34
EC (ecu)	6.63	7.17	7.28	17.23	18.64	18.94
Finland (markka)	32.87	35.13	35.49	85.44	91.34	92.26
France (franc)	46.04	49.32	51.14	119.68	128.23	132.96
Germany (mark)	13.57	14.50	15.06	35.27	37.70	39.16
Italy (lira)	10,171	10,922	11,204	26,442	28,395	29,128
Japan (yen)	1,195	1,309	1,286	3,106	3,402	3,343
Netherlands (guilder)	15.25	16.35	16.99	39.65	42.50	44.18
So. Africa (comm. rand)	23.18	24.88	22.55	60.26	64.68	58.62
So. Korea (won)	6,525	6,931	6,068	16,963	18,018	15,776
Spain (peseta)	847.69	927.79	967.11	2,204	2,412	2,514
Sweden (krona)	50.61	54.56	54.90	131.58	141.83	142.73
Switzerland (franc)	11.52	12.38	13.31	29.96	32.18	34.60
Taiwan (dollar)	242.29	258.36	231.25	629.91	671.69	601.20
UK (pound)	4.64	5.04	5.28	12.07	13.10	13.73
US (dollar)	9.10	9.70	8.85	23.66	25.22	23.01

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Jan. 31, 1991)**	**Last Month (Dec. 31, 1990)**	**12 Months Ago (Jan. 31, 1990)**	**This Month (Jan. 31, 1991)**	**Last Month (Dec. 31, 1990)**	**12 Months Ago (Jan. 31, 1990)**
Australia (dollar)	11.97	11.87	12.10	31.13	30.85	31.46
Belgium (franc)	289.32	282.58	327.43	752.17	734.65	851.25
Canada (dollar)	10.91	10.61	10.99	28.37	27.59	28.58
EC (ecu)	6.85	6.76	7.61	17.80	17.59	19.79
Finland (markka)	33.95	33.14	37.09	88.26	86.16	96.43
France (franc)	47.55	46.53	53.46	123.63	120.96	138.97
Germany (mark)	14.02	13.68	15.74	36.44	35.56	40.93
Italy (lira)	10,506	10,303	11,710	27,314	26,785	30,444
Japan (yen)	1,234	1,234	1,344	3,209	3,209	3,494
Netherlands (guilder)	15.76	15.42	17.76	40.96	40.09	46.17
So. Africa (comm. rand)	23.94	23.47	23.57	62.25	61.01	61.27
So. Korea (won)	6,740	6,538	6,343	17,522	16,996	16,489
Spain (peseta)	875.64	875.18	1,011	2,276	2,275	2,628
Sweden (krona)	52.28	51.46	57.38	135.92	133.79	149.18
Switzerland (franc)	11.90	11.68	13.91	30.95	30.35	36.17
Taiwan (dollar)	250.28	243.71	241.70	650.67	633.60	628.38
UK (pound)	4.79	4.75	5.52	12.47	12.35	14.35
US (dollar)	9.40	9.15	9.25	24.44	23.79	24.05

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF₆ This Month (Jan. 31, 1991)	per lb U as UF₆ Last Month (Dec. 31, 1990)	per lb U as UF₆ 12 Months Ago (Jan. 31, 1990)	per kg U as UF₆ This Month (Jan. 31, 1991)	per kg U as UF₆ Last Month (Dec. 31, 1990)	per kg U as UF₆ 12 Months Ago (Jan. 31, 1990)
Australia (dollar)	1.85	1.88	1.96	4.07	4.15	4.33
Belgium (franc)	44.63	44.78	53.10	98.39	98.72	117.06
Canada (dollar)	1.68	1.68	1.78	3.71	3.71	3.93
EC (ecu)	1.06	1.07	1.23	2.33	2.36	2.72
Finland (markka)	5.24	5.25	6.01	11.55	11.58	13.26
France (franc)	7.34	7.37	8.67	16.17	16.25	19.11
Germany (mark)	2.16	2.17	2.55	4.77	4.78	5.63
Italy (lira)	1,621	1,633	1,899	3,573	3,599	4,187
Japan (yen)	190.39	195.60	217.96	419.74	431.23	480.52
Netherlands (guilder)	2.43	2.44	2.88	5.36	5.39	6.35
So. Africa (comm. rand)	3.69	3.72	3.82	8.14	8.20	8.43
So. Korea (won)	1,040	1,036	1,029	2,292	2,284	2,268
Spain (peseta)	135.07	138.69	163.92	297.78	305.76	361.37
Sweden (krona)	8.06	8.16	9.31	17.78	17.98	20.51
Switzerland (franc)	1.84	1.85	2.26	4.05	4.08	4.97
Taiwan (dollar)	38.61	38.62	39.20	85.11	85.15	86.41
UK (pound)	0.74	0.75	0.89	1.63	1.66	1.97
US (dollar)	1.45	1.45	1.50	3.20	3.20	3.31

SWU Value And UF₆ Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Jan. 31, 1991)	SWU Value at 0.30 w/o Tails Assay Last Month (Dec. 31, 1990)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (Jan. 31, 1990)	UF₆ Value per kg U as UF₆ This Month (Jan. 31,1991)	UF₆ Value per kg U as UF₆ Last Month (Dec. 31, 1990)	UF₆ Value per kg U as UF₆ 12 Months Ago (Jan. 31, 1990)
Australia (dollar)	64.97	66.15	70.63	35.03	37.29	33.87
Belgium (franc)	1,570	1,575	1,912	846.41	887.89	916.81
Canada (dollar)	59.21	59.16	64.18	31.93	33.35	30.78
EC (ecu)	37.15	37.71	44.45	20.03	21.26	21.31
Finland (markka)	184.19	184.72	216.54	99.32	104.13	103.85
France (franc)	285.01	259.33	312.07	139.12	146.19	149.67
Germany (mark)	76.04	76.24	91.91	41.00	42.98	44.08
Italy (lira)	57,002	57,426	68,363	30,737	32,372	32,789
Japan (yen)	6,696	6,880	7,847	3,611	3,878	3,763
Netherlands (guilder)	85.48	85.96	103.69	46.09	48.46	49.73
So. Africa (comm. rand)	129.90	130.80	137.58	70.05	73.74	65.98
So. Korea (won)	36.567	36,439	37,027	19,718	20,542	17,759
Spain (peseta)	4,751	4,878	5,901	2,562	2,750	2,830
Sweden (krona)	283.95	286.84	334.99	152.95	161.70	160.66
Switzerland (franc)	64.59	65.08	81.22	32.83	36.68	38.95
Taiwan (dollar)	1,358	1,358	1,411	732.20	765.77	676.77
UK (pound)	26.01	26.49	32.22	14.03	14.93	15.45
US (dollar)	51.00	51.00	54.00	27.50	28.75	25.90

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[1] **Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.**

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RECENT DEVELOPMENTS

SOUTH AFRICA

1990 Uranium Production

Uranium production in South Africa declined in 1990 for the seventh consecutive year, falling nearly 17% from 1989's level, to 6.2 million pounds equivalent U_3O_8 (**Table 1**). Production fell over 15% in the fourth quarter compared to third quarter levels. 1990's lower total production is largely due to the the shutdown of Freegold's Joint Metallurgical Scheme (JMS) operation. The decline in the yearly total is also the result of reductions at Vaal Reefs and much lower production from East Rand Gold and Uranium Company, Ltd. (ERGO). Only one operation showed an increase in 1990 production; Western Areas' increase was primarily due to an increase in ore grade. Low market prices for both gold and uranium, high operating costs, and sanctions remain the primary causes of the difficulties experienced by the South African uranium industry.

At one time, Freegold was South Africa's second largest uranium producer, but it produced no uranium in the fourth quarter of 1990. Freegold tested the feasibility of using higher-grade feedstock following the March 1990 shutdown of the JMS, but it also proved uneconomic and production ceased during third quarter 1990. ERGO also announced that its uranium operations were no longer economically viable, so after continuous decreases in quarterly production rates, ERGO will close down the operation in April 1991.

Vaal Reefs, South Africa's largest uranium producer, also is experiencing economic difficulties. It has announced that production at its west uranium plant has been reduced by 50 percent. In addition, production at its east uranium plant has been suspended for three months until further options have been considered or until economic conditions improve.

Outlook For the Future

The viability of uranium production at South Africa's five remaining producers will continue to erode with high inflation rates, low market prices for gold and uranium, and continued international sanctions against South Africa.

Table 1
SOUTH AFRICA
1990 URANIUM PRODUCTION[1]
(thousands of pounds U_3O_8)

Operation	TOTAL 1989	First Quarter 1990	Second Quarter 1990	Third Quarter 1990	Fourth Quarter 1990	TOTAL 1990	Percent Change[2]
Buffelsfontein	856	190	174	174	161	699	–18.3
ERGO[3]	382	57	57	57	43	213	–44.2
Freegold[4]	978	213	85	70	0	368	–62.4
Hartebeestfontein	759	194	179	179	173	725	–4.5
Vaal Reefs	3,935	948	925	921	780	3,575	–9.1
Western Areas	496	120	135	154	170	579	+16.7
TOTAL[5]	**7,406**	**1,723**	**1,555**	**1,555**	**1,326**	**6,159**	**–16.8**

[1] Excludes Palabora Mining Company, which is not a member of the Chamber of Mines.

[2] Change in percent from the 1989 totals.

[3] ERGO = East Rand Gold and Uranium Company Ltd.

[4] Formerly Free State Joint Metallurgical Scheme.

[5] Columns may not add up due to rounding.

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WASHINGTON FOCUS

by Linda L. Gunter

Congress reconvened January 3, but because attention is focused on the war with Iraq, little was accomplished. Between floor statements about the war, new legislation was introduced and committee assignments were made. As a result of last November's elections, the Democrats increased their majority and thus the ratio of Democrats to Republicans. This allows them to add one or two members to committees. This increase in Democratic influence will be felt in the key committees which consider nuclear issues, including energy and appropriations committees. For example, the Senate Energy and Natural Resources Committee will have five new members—three Democrats, Richard Shelby (D-AL), Wyche Fowler (D-GA), Paul Wellstone (D-MN), and two Republicans, Larry Craig (R-ID) and John Seymour (R-CA). It is too early to predict whether these changes will affect the committees' support for nuclear issues. In the House Interior Committee, the Democrats have voted Representative George Miller (D-CA) Vice-Chairman because Chairman Morris Udall (D–AZ) has been hospitalized since the beginning of the year. Vice-Chairman Miller has the authority to organize the committee and set the agenda until Chairman Udall returns. This change is particularly distressing news for the nuclear industry because Rep. Miller is a vocal critic of the nuclear industry, and has already introduced a bill which would disallow the NRC's Below Regulatory Concern (BRC) waste disposal guidance, issued just last year.

DOE FY92 Budget Request

◇ DOE's FY92 budget request for uranium enrichment increased by about $47 million to $1.387 billion, offset by anticipated revenues of $1.547 billion. However, within the budget, DOE actually cut the operating budget for the gaseous diffusion plants from $1.089 billion in FY91 to $1.037 billion in FY92. Budgetary increases went to environmental clean-up at the plant sites. The AVLIS budget also increased, from $154.5 million to $213.6 million, but spending has been restricted to demonstration of the process only; no money has been allocated for deployment. DOE has determined "based on policy considerations and budgetary restraints on government spending, that the government should avoid investments in the uranium enrichment enterprise that could more appropriately be made by the private sector." All activities leading toward deployment, including implementation of an industrial access program, selection of a commercial deployment contractor, site selection, and preparation of environmental impact statements, are now on hold until either a government corporation is created or until Congress, through the appropriations process, authorizes their continuation. AVLIS deployment was approximately two years behind schedule and this new DOE action will delay the program at least another year.

Uranium Enrichment Legislation

◇ Senator Wendell Ford (D-KY) introduced the Uranium Enrichment Act of 1991 (S–210) on January 15. His new position as Democratic Whip will speed passage of the bill, which is essentially identical to the version passed by the Senate in 1989. In the House, Rep. Bob McEwen (R-OH) reintroduced the administration's bill, the Uranium Enrichment Reorganization Act (HR-145). Although Rep. McEwen is not a member of any of the House committees with jurisdiction for this bill, his new position as a member of the House Rules Committee may be beneficial to efforts to pass the bill, should it ever move beyond the committee hearing stage.

NGA Nuclear Policy Statement

◇ On February 5, the National Governors Association (NGA) endorsed, as part of their nuclear energy policy statement, restructuring of the DOE's uranium enrichment program as a government corporation. The NGA also endorsed federal payment for clean-up of abandoned uranium mines and inactive mill tailings piles. The measure

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states "The Governors support immediate enactment of measures that would help restore viability within the uranium industry as required under Section 161v of the Atomic Energy Act of 1954" ... and "immediate application of US trade laws to counter importation of subsidized natural and enriched uranium and other unfair trade practices." Umetco Minerals Corporation, as one of the last US-owned uranium mining companies, was the primary sponsor of the NGA endorsement.

Legislative Agenda

◇ Although Congress and the Administration are preoccupied by the war with Iraq, discussion continues about legislative priorities for the year. The annual budget and appropriations process should be less contentious than previous years, because the agreement reached last year sets five-year spending limits. A national energy policy should be a priority, but indications are that energy legislation may be delayed until after the war is over. Energy policy options are still being debated within the administration which may delay the presentation of the administration's bill to Congress. Congress has already introduced 25 energy-related bills. Nuclear issues such as spent fuel disposal should receive some attention, and a bill to assist the industry's efforts at constructing the next generation of nuclear power plants may also be considered. Energy security issues will receive more attention this year, relegating the nuclear industry's legislative agenda to a lower priority. ●

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INDUSTRY BRIEFS

LES Files Application For US Enrichment Plant

Louisiana Energy Services (LES) filed an application with the Nuclear Regulatory Commission (NRC) on January 31, 1991 for a license to construct and operate a uranium enrichment plant. If approved, the LES plant will be the first privately-owned enrichment plant in the USA. The NRC may take up to two years to consider the application. A formal adjudicatory public hearing must be held when the NRC completes its review of the application. Construction on the facility is planned to begin in early 1993, assuming timely NRC approval of the license. LES has stepped up its efforts to gain financial commitments for construction and also increased its efforts to market the plant's potential production.

◆ ◆ ◆

Denison Seeking Partner To Cure Financial Problems

Denison Mines is seeking to amalgamate with another company as one possible solution to its current financial problems. Recently-hired president Bill James indicated that a hard-rock mining company could be a candidate since such a company could benefit from Denison's unused depletion allowances, currently totalling over C$100 million.

Germany's New Coalition Government Agrees To Revise Atomic Act

The new coalition government of Germany has agreed to a proposal to substantially change the German Atomic Act. Among the changes proposed: the promotion of the peaceful use of nuclear energy would no longer be a mandate of the act; plant operators will no longer be compensated for required safety-related backfits; construction and management of nuclear waste storage facilities would be turned over to private industry; the mandated bias towards reprocessing and away from direct disposal of spent fuel would be eliminated.

Industry officials quickly expressed displeasure with the proposed revisions to the Act, and assured lawsuits would be filed if the Act is revised as proposed by the coalition government.

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Spain's ENUSA Begins Construction of Uranium Concentrates Plant

Empresa Nacional del Uranio SA (ENUSA), the Spanish nuclear fuel and fuel fabrication company, has begun construction of a 950-ton per year uranium concentrates plant. The plant, which is scheduled for completion in three years, is located in the Salamanca province. Upon completion, the plant will be able to process all of Spain's needs for uranium concentrates.

Korea Electric Power Corp. Adds Plans For 5 Reactors, Including Candu

Korea Electric Power Corp. (Kepco) has plans to invest US$61.2 billion during this decade for the construction of 39 new power stations. Five nuclear units are included in the station plans. The completion of the five units would give South Korea a total of 14 nuclear power plants, which will provide nearly one third of the country's electricity by the year 2001.

At least one of the new nuclear units will be a Candu-type reactor as KEPCO recently signed a contract with Atomic Energy of Canada Limited (AECL) to purchase a 680-MWe reactor. This reactor, Wolsong-2, will be South Korea's second Candu reactor, an updated version of the Wolsong-1 Candu reactor. Construction on the US$1.2 billion project, located on South Korea's southeast coast, is scheduled to begin in 1992 with completion in 1997. South Korea will have the primary responsibility for construction management and project supervision.

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Czech Bohunice-1 & -2 VVERs To Remain In Operation Through 1991

The Czechoslovakian government decided in January to continue operating the old Soviet-designed VVERs (model 230s) at the Bohunice site at least through 1991, but only if certain safety-related backfits can be accomplished. The entire backfit program is planned to take two years, and cost over US$100 million. The first backfits will improve emergency and fire-protection systems.

Completion of the entire backfit program may gain the Bohunice-1 and -2 units approval to operate through 1995. After that time, Czechoslovakia plans for its safety regulations to match the level of Western Europe, and it is unlikely these Bohunice VVERs could be brought into compliance with these even stricter regulations.

◆ ◆ ◆

Germany Closes Down Last of Greifswald VVERs

The last operating unit of the four old-style (model 230) Soviet-designed VVERs at the Greifswald station in eastern Germany was closed down at the end of 1990. The unit, built in 1973, was closed because it could not meet the stricter safety standards of the unified Germany. The other three Greifswald VVERs were shutdown earlier in 1990 for the same safety reasons, however closure of the last unit was delayed until completion of a substitute oil-powered generating station.

Sweden's Political Parties Finally Agree On Nuclear Phaseout Plans

On January 15, Sweden's three major political parties—Social Democrat, Liberal and Center—announced they had reached an agreement on a plan for the phasing out of nuclear power in their country. However, the parties released few details of the agreement, leaving unexplained how the many political and legal issues hindering the phaseout plan were resolved.

The agreement calls for an investment of nearly US$1 billion in development of renewable energy sources and conservation measures. Also, CO_2 emissions will not be allowed to increase above 1988 levels. Further details should be released soon, particularly confirmation of whether the phaseout plan's initiation date of 1995 and completion date of 2010 (the latter mandated by parliament in 1980) are still considered viable, or whether this scheduling must be delayed.

The agreement is not yet policy, but proposed laws regarding the phaseout plans should have a strong chance of passage, since the parties have apparently worked out their major differences.

ABB Forms Italian Consortium

ABB Atom of Sweden, with Italy's Ansaldo, and Fiat Componenti e Implanti (a Fiat subsidiary) are forming a new consortium, Consorzio Pius. The consortium will develop a design, based on ABB's PIUS LWR, that meets Italian licensing requirements, thereby positioning the new firm for a reconsideration of nuclear power by the Italian government. ABB will own 60% of Consorzio Pius, while Ansaldo will own 25%, and Fiat, through its subsidiary, will own the remaining 15%.

◆ ◆ ◆

Japanese Pro-Nuclear Governor Reelected, Fuel Cycle Plant Likely to Proceed

On February 3, 1991, incumbent governor Masaya Kitamura was reelected to his fourth term in the Aomori Prefecture. The pro-nuclear governor received 44% of the votes in defeating his two anti-nuclear opponents. The Aomori Prefecture includes the village of Rokkasho, the construction site of Japan's first major fuel cycle facility. Plans for the site, with projected costs of over US$9 billion, include a uranium enrichment plant, low-level waste storage, and a plutonium-extraction plant, though the latter has yet to receive governmental construction approval. The election was an important hurdle for the Japanese nuclear industry as completion of the plant figures prominently in the self-sufficiency goals of Japan's long-range nuclear energy plans.

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WHEN WILL NUCLEAR POWER RETURN?

This essay by J. Robert Wolcott, Chairman of NUEXCO's International Advisory Committee and former chairman of NUEXCO, comments on when nuclear power will be ready to return in the United States. Right now, neither the country as a whole, nor the nuclear industry, is prepared for a renewal. Mr. Wolcott discusses what steps by the industry are necessary to lead to a renewal of nuclear power in the USA.

After a negative trend lasting 15 years, the United States' nuclear program appears to have bottomed and taken a slight upward turn. Actual and potential electrical power shortages; an ever increasing variety of electrical power applications; fossil fuel pollution; Middle East upheavals; and nuclear technology advancements are largely responsible. Future generations will not indefinitely forego the use of the inexhaustible, clean, energy source that nuclear power provides, so eventually it must return to commercial service. But when? Will it be in the foreseeable future? The answer depends largely upon the answers to these three questions:

1. When will the need for electrical power in the United States be such that nuclear power becomes unavoidable?
2. When will nuclear power offerings be available from suppliers in the form that the market desires, and with the required verifications?
3. Assuming 1 and 2 above are positive—that is, nuclear power is available and its use is a necessity— when will social and political conditions permit deployment?

When Will Nuclear Power Be Needed in the United States?

Electrical power demand in the United States will continue to grow. The consensus is that growth will be approximately 2.5% per year. This growth rate translates into a need to have 150 to 200 additional large power plants operating by the turn of the century. Construction for most of these has not yet started.

If a combination of coal, oil, or natural gas was suitable in all respects, nuclear power construction might be delayed indefinitely. However, economics, long-term availability, and pollution do not favor expanded use of fossil fuels in the long term, or even the intermediate term. A substitute for nuclear power is not on the horizon.

Despite shortages which already exist, I do not believe all of the 150 to 200 plants needed by the end of the century will be built. Too many obstacles to power plants of all types remain. Consequently, electrical power shortages will become more common and severe, and public pressure for a solution will increase. A more favorable political attitude would be expected, but that does not necessarily mean nuclear power will suddenly expand. Nuclear power is needed today, but cannot expand because preparations are not sufficient to meet the need. The most important immediate need, therefore, is to proceed with preparations required for nuclear's expanded use.

First Era Background

Before looking ahead to a "Third Era" (the future) of nuclear power, I think it is worthwhile to recall how nuclear power evolved in the "First Era" (initial expansion) and the "Second Era" (cutbacks and cancellations), for there are lessons to be learned and pitfalls to be avoided.

Two United States pioneering plants, Dresden One by General Electric, and Yankee Electric by Westinghouse, provided the basis for light-water reactors throughout the world. Those projects were begun around 1955, and were successfully completed and placed in operation by 1960. Each had a capacity of approximately 200 MWe. Warranties were met. Costs were near estimates. Safety, reliability, and technical feasibility were demonstrated.

After the demonstration of successful results, orders of larger plants followed. Much of the buying was motivated by environmental advantages (coal was dirty) and an uneasiness about long-term commitments to oil (largely Middle East problems). What began as a modest rate of buying later developed into a surge. In the late 1960s and early 1970s, orders for new nuclear plants sometimes

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exceeded a rate of 20 plants per year, in sizes from 600 to 1,200 megawatts. The attraction to nuclear power continued for a time. By the early 1970s, two hundred plants were ordered or planned.

But due largely to much higher oil prices, an unexpected downturn in the economy occurred. That downturn, and higher energy costs in general, reduced the electrical growth rate. The projected growth rate of 7 percent, which was the basis for new construction plans, dropped to between 3 and 4 percent.

The Second Era

The revised projections substantially reduced new plant requirements. Coal, nuclear, and other types of power generating plants were cancelled to bring future building into line with the revised projections. Ordering of all new capacity stalled for a time. Nuclear never recovered due largely to the Three Mile Island (TMI) accident in 1979. Emphasis shifted to coal.

As the past may provide a guide to the future, several observations are relevant. First, buying did not begin until demonstration plants operated successfully. Had there not been demonstration plants, it is unlikely that buying would have occurred at all. Second, buying was motivated, even then, by considerations not unlike those the nation faces now. Coal, oil, and gas supplies were not considered sufficient, nor environmentally sound. Third, once buying began, it escalated too rapidly, with the result that suppliers, users, and regulators were overloaded.

Changes for the Third Era

The First and Second Eras of nuclear power spanned 35 years, and included some great successes and great failures. The fact that nuclear has come to produce 20% of the nations' power in a relatively short time is an important success. On the other hand, the fact that confidence was lost and new orders stopped in the mid-1970s is an important failure. The challenge for the future is to build upon successes of the past, while avoiding its failures. A number of new issues and situations must be taken into account.

First, it would be easy, but misleading, to assume that termination of orders in the 1970s was an unfortunate discontinuity in the normal progress of the industry's development, and that once over, the industry could pick up where it left off, as though the discontinuity had never occurred. Too much has changed for that. Virtually a whole new start must be made.

Second, the people who now manage nuclear suppliers, utilities, various government bodies, and others in control today, were not in positions of policy control in the 1950s. Most, in fact, had not even reached middle management at that time. The experience upon which they now draw, and which influences their thinking, has grown mainly out of the Second Era—an era of frustrating delays, cost problems, environmental attacks, public resistance, regulatory conflict and feeble government help. I think they feel—justifiably—that it is unwise for them to make commitments in advance of what the government clearly and effectively supports. In fact, a desirable, and probably essential condition is that public pressure be applied on government to act and for government to then press industry.

> *The challenge for the future is to build upon successes of the past, while avoiding its failures.*
>
> *First, a new start must be made.*
>
> *Second, public pressure must be applied on the government to act and the government to then press industry.*
>
> *Third, standardization must be achieved.*

It is not likely to happen the other way around, where industry commitment leads as it did in the 1950s. Given past experience and current attitudes, it would be a rare board of directors, top management, and group of investors

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that would authorize a nuclear plant purchase until reasonable assurances are available that the debacles of the first era will not repeated.

Third, standardization must be achieved. The solutions to many problems, including industry organization, cost control, schedule control, system design, and licensing depend upon the realization of standardization. Basic technical knowledge available for design is at least adequate. Technical feasibility of light-water reactors, in particular, is well established. Current knowledge is a thousand times or more greater than that which existed in the 1950s.

> ***Deployment of the next era of nuclear power plants will only take place when and if the benefits, including cost and environmental benefits, are sufficient to justify use. Nuclear should not be, and will not be, chosen simply because it is nuclear.***

Despite this wealth of knowledge, achieving standardization will be difficult in the United States system. Success will not be automatic simply because standardization is policy. Project cycles are long, and long cycles are subject to continual pressures for change. The United States has many users, supplier participants, and regulatory bodies. The eight to ten years required from the start to finish allows for many influences to work against the status quo. New ideas are offered. Experience on one project suggests change on the next. Safety proposals are especially difficult, as even small modifications cannot be rejected out of hand. No one wants to be on the wrong side of safety issues.

Cost improvement suggestions, as well, can be difficult and less easily rejected than it may appear. For example, a $10,000 investment in a modest design change may promise a $100,000 savings in construction. That change repeated on ten projects would save $1,000,000. A ten thousand percent return is not easily ignored, especially with prudency reviews lurking in the background. Varying site conditions and engineered equipment (such as pumps) also open design to modification. And once changes begin for whatever reason, the door is opened to a chain of regulatory modifications.

All that, of course, does not lessen the merits of standardization. It does, however, suggest that buyers will look for solid evidence that standardization is actually achieved before placing a firm order.

Fourth is the demand for increased safety. The public wants more. There can be no persuasive argument for less. At one time suppliers and users met what was accepted as a standard of safety and focused competition on economics and reliability. Today, a nuclear system must be economic, all things considered, but superior safety will be much more influential. In short, safety competition takes precedence over economic competition.

Yet safety competition adds uncertainty. Suppliers and users face choices which cannot be avoided. The most complete advanced designs are being prepared in the United States and constructed in South Korea and Japan. They are available for the United States. However, later concepts believed to be superior from a safety standpoint (called inherently safe and passively safe concepts) are also in development and design, though less advanced. The latter will not be ready for commercial deployment as soon as the former.

However, their unique, and perceived safety advantages, force decisions. How will suppliers and users who risk substantial investments, ultimately decide? Should they place their bets on the model most available, or should they take the longer route with the safer, but as yet unproven models? Or some combination? What are the risks if they proceed with the more proven, but less safe designs and are challenged by consumer and environmental advocates? Are they willing to defend the choice, knowing that they may have to argue economics and schedule ahead of safety? What is the risk that public pressure may force a change—that is, abandoning an early choice in favor of a later, safer, concept? We know that the safer approach, even if based only on theory, usually wins.

The Need for Two Stages in the Third Era

To accommodate the conditions outlined, I believe we must think in terms of progressing through two stages in

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the third era: a demonstration stage and a deployment stage. More specifically, I view these stages as follows:

The *Demonstration Stage* should lay an extensive, solid, and complete foundation upon which to build. It must entail designing, constructing, and thoroughly testing standardized, licensed, economically competitive, even safer, full-scale nuclear power plants. An eight to ten year cycle will be required. A start is underway; the Westinghouse AP-600 pressurized water reactor and the General Electric SBWR (Simplified Boiling Water Reactor) are being designed.

The *Deployment Stage* must build on demonstration plant results. Deployment will only take place when and if the benefits, including cost and environmental benefits, are sufficient to justify use. Nuclear should not be, and will not be, chosen simply because it is nuclear. (Although some will resist nuclear simply because it is nuclear.)

What does this two-stage approach say about the timing of nuclear renewal? If deployment must await demonstration stage results, and the demonstration stage will require eight to ten years, then a renewal might be practical around the turn of the century. Perhaps a few bold users will order earlier assuming success of demonstration plant performance, but they are likely to be few in number and commitments may be only contingent.

On the other hand, once a successful demonstration stage has been completed, ordering may resume with confidence. I do not see a surge of orders as occurred in the 1960s. I do foresee a more careful buildup consistent with suppliers, users, and regulator's capabilities.

Critical Demonstration Stage Considerations

Because a demonstration program schedule will determine when nuclear power has the capability to provide a significant share of the 20 to 30 new plants needed each year, it is important to mention some considerations affecting the timing, effectiveness, and quality of such a program.

The Need For Competition

Competition between demonstration plants and their suppliers and users is essential. Competitive results should include safety, economics, and reliability. At least two, and preferably three or four, projects should proceed on similar schedules.

A single national design with competition limited to construction, as has been suggested by some, would be inadequate "semi-competition". Construction costs, safety, reliability and operability start in design. Many incentives will be lost without comprehensive competition. Moreover, a national project, as a single design would undoubtedly become, would most likely end up with the government in control. The government record for successful energy projects is notoriously bad, and if that should happen in this case, nuclear power may be set back another decade or two.

Government Support

Government support is required in some form. The best form would be for the government to assume responsibility for cost increases that were caused by government action which occurred after some agreed point in time. Private investors could stand for costs within their control, but the worrisome part of a nuclear project are costs caused by decisions outside their control.

Anti-nuclear Opposition

The public is ambivalent about nuclear power. A solid majority expect it to play an important role in the future, but few favor a plant in their community. The problem, nevertheless, is not so much with the majority as with anti-nuclear forces whose influence is far beyond what their numbers justify in a democratic system. Thus far, Congress, and to some extent the courts, have not shown a willingness to confront these special interests. That will have to change.

Organization

The next nuclear plant purchase will likely be by investors formed as an independent power producer. The objective may be both to produce electrical power and to serve as a demonstration plant. Comparable organizations are being discussed in the industry, but one has not yet coalesced. The supplier side also needs reorganization to provide fixed-price turnkey plants, much as was done in the first era in the United States and is now done by other suppliers in France and Japan.

Siting

Selection of sites for demonstration reactors is critical, for every year of delay experienced in the demonstration phase will mean a year of delay for the beginning of the deployment stage. The urgency for nuclear use will continue to increase each year.

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Wide public acceptance remains a problem, but attitudes vary by communities. For example, I believe it would be possible to build several demonstration plants in Idaho near the present Idaho National Engineering Laboratory (INEL) site with little, if any, resistance. In fact, the opposite is probable, for the community would likely welcome projects of that type. Community leaders, the governor, the legislature and other leaders are encouraging this type of activity.

Nuclear Waste

Nuclear waste is not directly a part of a demonstration plant program discussed herein, but is relevant and important to it. The waste problem needs to be publicly perceived as "solved", or on its way to solution by the time the demonstration program is complete.

> *Nuclear power is needed today, but cannot expand because preparations are not sufficient to meet the need.*

Countries which have taken action to store and handle waste, even though approaches differ, do not have the so-called waste problem of the United States and other countries, which have muddled waste programs. Sweden and Finland store spent fuel in deep underground facilities. France and the United Kingdom reprocess and store glassified waste. In these countries the waste issue is minor or non-existent.

The United States' waste problem is that little gets done, and when projects eventually do begin, they are allowed to be blocked, as with the New Mexico and Nevada facilities. With a well-managed waste program, the waste problem could virtually disappear by the turn of the century, when the solution is most needed.

Summary and Conclusion

Let's return to the questions posed at the outset: the need for electrical power; the readiness of the industry; and the evolution of social and political attitudes. What can we conclude?

There is little question that the United States will need nuclear power. The sooner it is available the better, for electricity use is growing more rapidly than generating capacity. For these reasons, some experts expect growth in the industry in about five years. However, I believe we are not prepared to proceed on that schedule—not because the need will not exist, but because preparations will require eight to ten years. Therefore, the critical program on which to concentrate is a new generation of demonstration plants as a foundation for the future. Every year of delay for these plants will mean a year of delay in true expansion.

The social and political climate ten years hence is, of course, difficult to predict. But insofar as nuclear power is concerned, recent improvements are evident and there is reason to believe those will continue. Public and government support appears adequate now to support a demonstration program of the type described. Even many of those unenthusiastic about nuclear power are reluctant to forego the option—the future is too uncertain. My belief, all things considered, is that the outlines of a demonstration program will take form in the next year or two and will proceed to completion, though not entirely without difficulty. I estimate a renewal—that is, commercial expansion—will begin in ten years and grow steadily after that.

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URANIUM INDUSTRY OF EASTERN GERMANY

For more than forty years, the former German Democratic Republic (GDR) was the most important uranium producer of the former Eastern Bloc countries. Between 1946 and 1990, it produced about 570 million pounds equivalent U_3O_8, which greatly exceeds combined western Europe uranium production and equals two-thirds of US uranium production over the same period. However, the political changes in Eastern Europe and the reunification of Germany on October 3, 1990 have changed the situation. Strict West German safety and environmental regulations, combined with the introduction of the DM (West German Deutsche Mark) and other factors such as cancellation of the Soviet-East German uranium trade agreement, have put pronounced economic pressure on uranium mining in eastern Germany. SDAG Wismut, the exclusive uranium producer, has little choice other than to close its uranium mines in the near future.

Background & Electrical Power Generation

The former GDR encompassed a surface area of about 108 thousand square kilometers (40,300 square miles), which is about the size of the US State of Tennessee (109,000 km^2). The GDR's 16.4 million inhabitants now comprise about 20% of the population of unified Germany (78 million). GDR electricity generation totalled 115 billion kWh in 1989, approximately 83% of which was generated at lignite-fueled power plants (installed capacity 13,260 MWe), and about 10% was from nuclear power plants.

The GDR mined 320 million tonnes of lignite in 1989 and 1990, placing the GDR as the largest lignite producer in the world. But lignite's high sulfur content and dust generation resulted in an extremely high pollution rate. GDR lignite-power stations emitted about 310 kg of sulfuric acid per person per year, compared to 30 kg per person in western Germany. Lignite dust development was about 2.2 million tonnes per year in East Germany, compared to 0.56 million tonnes per year in West Germany.

The GDR's nuclear power program had plans to construct two Soviet-designed commercial nuclear power stations with a total capacity of 7,500 MWe by the end of this century. The first station at Lubmin near Greifswald (**Figure 1**), was designed for eight reactors of 440 MWe each. At the end of 1989, Greifswald units 1–5 were operating and three additional reactors were under construction. In early 1990, units 2 and 3 were shut down because they did not meet West German safety standards. All of the other Greifswald units were shut down later that same year.

A second station at Stendal on the Elbe river was to include four reactors of 1000 MWe each. Two units were under construction in 1990 and the other two were in the planning stage. In spite of the urgent need to replace the polluting lignite-fueled power plants, completion of the nuclear plants as originally designed is now unlikely. The reactors must be redesigned if they are to comply with rigid western safety standards. Concerns of active antinuclear groups in Germany may also affect completion of the units.

Uranium Mining Industry

Uranium minerals were noticed in the mines of the Erzgebirge (Ore Mountains) of Saxony, long before they were chemically identified. Pitchblende from the Erzgebirge was mentioned as early as 1565, and other accounts of pitchblende date back to the year 1727. Uranium mining started in the Erzgebirge early in the 19th century. Approximately 110 tonnes of uranium were produced between 1825 and 1898.

In the immediate post-WWII period, uranium was produced only for military purposes. Ore was mined and milled in the GDR and the concentrates were shipped to the Soviet Union. The GDR then had to buy back the uranium it needed to fuel its nuclear power plants.

Mining methods in the 1940s and 1950s were old-fashioned and primitive, and working conditions were harsh and unhealthy. Some of the labor utilized during this period were prisoners or inmates of forced-labor camps. But since that time, mining techniques and safety standards have been improved and are now comparable to those in western countries.

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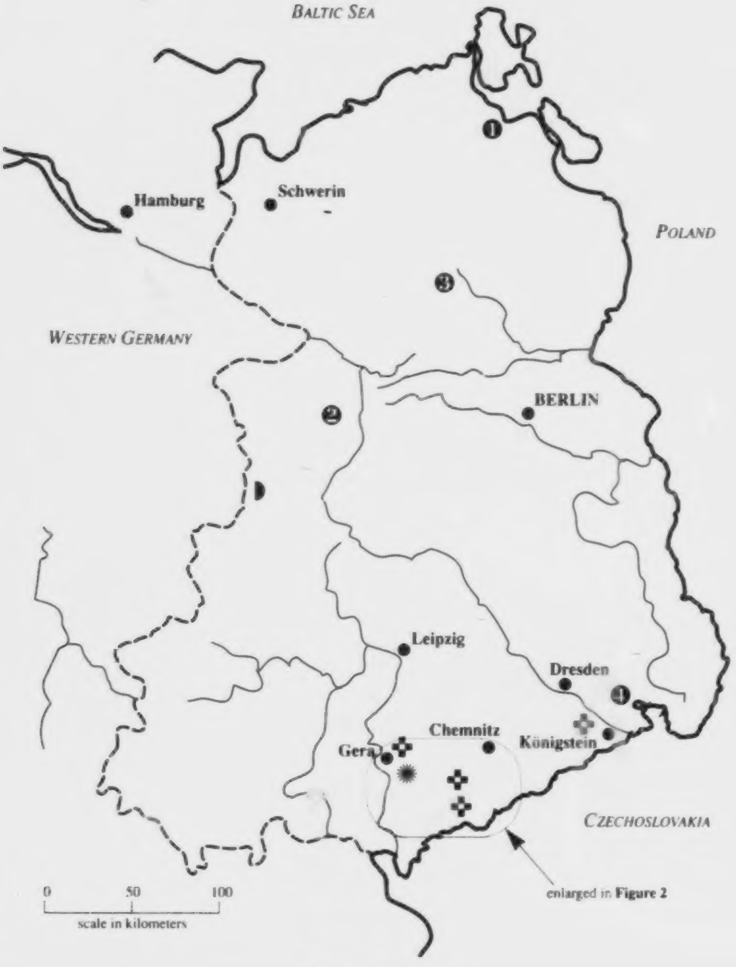
Figure 1
EASTERN GERMANY



Legend To Figure 1

✤ Uranium District
✸ Uranium Mill - Seelingstädt
◗ Nuclear Waste Disposal Site - Morsleben
❶ Greifswald Nuclear Station
❷ Stendal Nuclear Station
❸ Rheinsberg (70MW training reactor)
❹ Rossendorf Nuclear Research Ctr.

Up to 1956, all uranium mining in the former GDR was directed and administered by a Soviet enterprise. On January 1, 1956, the enterprise was transformed into a Soviet/German Joint-Stock Company, named SDAG Wismut, with headquarters in the city of Karl Marx-Stadt, now called Chemnitz. Shareholders of SDAG Wismut were the East German Ministry of Economics and the Ministry of Atom-Technique and Atom-Industry of the USSR. Both parties held 50% of the total capital of 4.5 billion GDR marks.

The basis for the joint operation was a contract between the Soviet and East German governments through the year 2000 for "Exploration, Mining and Treatment of Uranium Ores." Financing, annual production rates, deliveries, and prices were set out in five-year plans. The most recent extension was agreed upon in 1986 for the period through December 31, 1990. Due to the recent political changes, the Soviet Union did not sign a further extension.

The name Wismut, which means bismuth, was selected to camouflage the actual purpose of the enterprise, which was to mine uranium. All activities, production rates, manpower, and other information were declared top secret. Even within each level and among individuals within the company, all transmission of information of any kind was prohibited except to a listed superior. In fact, until two or three years ago, Wismut employees were prohibited from even using the term uranium. Instead, uranium could only be referred to as "metal." The security measures in East Germany were so tight and effective that very little information was known in the west, and that information was mostly speculative. This was in contrast to other COMECON countries, where at least some information on uranium ventures, deposits, and production reached the west.

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SDAG Wismut was like a state within the State. Besides uranium mining, the company had its own branches or subsidiary companies that provided all auxiliary services needed for the uranium mining, including manufacturing of required machinery, equipment, and instruments, housing construction, and research facilities. Wismut had its own medicare system and hospitals, and even its own police/security department. Until this past year, the director general was always a Soviet national, most recently Valentin Nasarkin. He has been succeeded by the first German director, Dr. Richter.

Wismut had an estimated workforce of more than 100,000 people in the 1950s. In 1990, Wismut employed about 39,000, nearly 20,000 of which worked in the mining branch.

Economics of Uranium Mining

Since 1980, uranium production costs have averaged between 200 and 250 GDR-Mark/kgU (about $58 per pound U_3O_8 using the offical 1:1 GDR-Mark to Deutsche Mark exchange rate). Uranium mining was expensive due to labor intensity, the necessity of selective mining, decreasing ore grades, reserve depletion, and increasing depth. The introduction of the DM in July 1990 imposed an additional burden on production economics, pushing recovery costs upwards even further. Under these economic conditions, probably very few, if any, of the uranium mines in eastern Germany will survive. The government is considering using some of the deep mines in the Erzgebirge (2000 meters deep) for storage of radioactive waste.

Environmental Impact

Over the years, not much effort has been directed towards reclamation and recultivation of mine dumps and mill and tailings ponds. Clean-up costs are estimated at US$ 3–4 billion.

Uranium Mining and Milling

Wismut operated about 50 mines during the 1960s and 1970s. In peak years, production exceeded 18 million pounds equivalent U_3O_8 per year. In 1990, seven mines were still active in four districts (**Figures 1 and 2**):

- Aue District, Saxony—Niederschlema-Alberode deposit;
- Pöhla District, Saxony—Tellerhäuser deposit;
- Königstein/Elbsandsteingebirge District, Saxony;
- Gera-Ronneburg District, Thuringia.

Conventional underground mining methods are used in all areas except Königstein, where chamber leaching techniques have replaced conventional methods. 1989 production totalled six million pounds equivalent U_3O_8.

Uranium ore processing currently takes place at Seelingstädt, about 10 km southeast of Gera, Thuringia. The mill began operation in 1960, and has a treatment capacity of 3.0 to 3.2 million tonnes ore per year (eight million pounds equivalent U_3O_8). Ore has been treated by both alkaline and acid leaching, but since 1990, only alkaline-leaching (with caustic soda) has been applied. Tailings are deposited in the former open pits at Culmitzsch and Sorge-Settendorf. In mid-1990, 1,600 people were employed at the Seelingstädt mill, about 900 of them directly involved in uranium production. Wismut also operated the Crossen mill near Aue, Saxony until it was closed in January 1990. In the 1960s, the mill processed 50 percent of East German uranium production.

URANIUM DEPOSITS ACTIVE IN 1990

Niederschlema-Alberode Deposit; Aue District

The Niederschlema-Alberode deposit, discovered in the late 1940s, is located north of Aue in the western Erzgebirge, 30 km southwest of Chemnitz. It is the main deposit in the Aue-Schneeberg uranium district. Total original resources are estimated at 230 million pounds equivalent U_3O_8, of which 190 million pounds had been mined by the end of 1989. These resources make Niederschlema-Albelode one of the largest, if not the largest, vein uranium deposits in the world. The mining grade varies, but a cut-off grade of $0.03^{w}/_{o}$ U is used and ore is blended to an average of $0.4^{w}/_{o}$ U in order to meet the processing standard at the Seelingstädt mill.

Geology and Mineralization

Uranium ores of the Niederschlema-Alberode deposit occur discontinuously in a series of steeply-dipping veins within an elongated area up to 2.5 km long, 400 to 500 meters wide, and in excess of 2000 meters deep.

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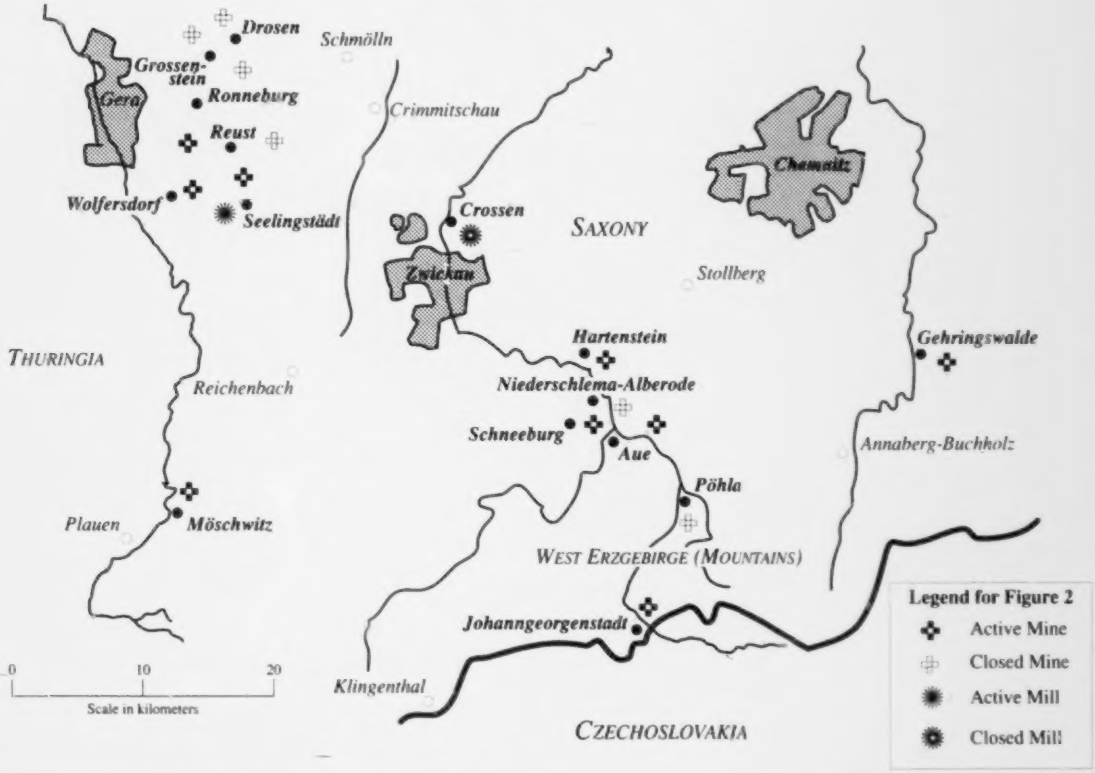
Figure 2
Uranium Facilities in the State of Saxony


Drosen
Schmölln
Grossen-stein
Gera
Ronneburg
Crimmitschau
Reust
Wolfersdorf
Seelingstädt
Crossen
Zwickau
SAXONY
Chemnitz
Stollberg
THURINGIA
Hartenstein
Gehringswalde
Reichenbach
Niederschlema-Alberode
Schneeburg
Aue
Annaberg-Buchholz
Pöhla
Plauen
Möschwitz
WEST ERZGEBIRGE (MOUNTAINS)
Johanngeorgenstadt
0
10
20
Scale in kilometers
Klingenthal
CZECHOSLOVAKIA
Legend for Figure 2
Active Mine
Closed Mine
Active Mill
Closed Mill

Individual veins average 1.3 meters in width, with rare veins as wide as 10 meters. Mineralization is of polymetallic vein-type. Country rocks are folded late-Proterozoic to early-Cambrian schists and gneisses with imbricated Silurian-Devonian metasediments. Granitic plutons and a variety of igneous dikes intruded into these sequences during the Hercynian Orogeny. A contact–metamorphic halo surrounds the granites, and all ore-bearing veins occur within this aureole. Approximately one thousand mineralized veins have been identified. Principal uranium minerals are pitchblende and coffinite, which are also associated with Ag, Co, Ni, and Bi minerals. Gangue minerals are predominantly quartz and carbonates.

Mining

The underground mine has more than 30 surface and internal shafts, with the deepest level reaching 1,880 meters below the surface. Mining levels are usually 30 meters apart, though some are 45 meters apart. The mining methods used are longwall (shrinkage) stoping and, at depth, a modified shortwall cut-and-fill method progressing upward. Minimum mining width is 0.8 meters. The high rock temperatures of 65°C at depth necessitate cooling systems which reduce air temperatures to 21–27°C. The mining blocks are served by an extensive rail haulage system. The hoisted ore is trucked 10 km to Hartenstein where it is blended to an average grade of $0.4^{w}/_{o}$ U, then shipped by rail to the mill at Seelingstädt (40 km). Current production is about 100 thousand tonnes of ore per year from a workforce of 4,500 employees.

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Tellerhäuser Deposit; Pöhla District

The Tellerhäuser deposit, discovered in 1973, is located about 20 km southeast of Aue, in the central-western Erzgebirge. Total original resources amounted to 17 million pounds equivalent U_3O_8, of which approximately three million pounds have already been mined. The mining grade varies, but a cut-off grade of $0.03\,^{w}/_{o}$ U is used and ore is blended to an average of $0.4\,^{w}/_{o}$ U in order to match the processing standard of the Seelingstädt mill.

Several tin and tungsten deposits (Hämmerlein, Tellerhäuser, and Globenstein) occur adjacent to the uranium deposit. Grades range from 0.1 to $0.63\,^{w}/_{o}$ Sn and locally up to $0.45\,^{w}/_{o}$ WO_3, and contain a total of almost 200 thousand tonnes Sn, about 40 thousand tonnes W, as well as other metals.

Geology and Mineralization

Uranium ore occurs intermittently in veins within a triangular area 1,500 meters long and up to 1000 meters wide. Almost 20 uranium-mineralized veins have been identified. Individual veins can be 500 to 1000 meters long and as much as 1.5–2.5 meters thick, but may be split into several branches. The veins extend over a vertical interval of 15 to 60 meters. Mineralization is of polymetallic vein-type. Country rocks are mica schists and two-mica gneisses of the late-Proterozoic to early-Cambrian Joachimsthal Series. Cambrian and Ordovician metasediments rest on the series. Hercynian granite occurs at a depth of 700 to 850 meters. Uranium mineralization is concentrated where the veins cut carbon and pyrite-bearing schists in the contact-metamorphic aureole (or skarn) surrounding the granite. Pitchblende and coffinite are the principal uranium minerals, and are commonly associated with Ag, Co, Ni, and Sn minerals, and quartz and carbonates.

Mining

Access to the Pöhla-Tellerhäuser uranium deposit is by a 6 km long drift at a level 600 meters above sea level from which two internal shafts extend into the deposit. Main levels are 60 meters apart (between 85 and 300 meters above sea level) with intermediate levels about 30 meters apart. Mining is by longwall (shrinkage) stoping, and ore is hauled underground by rail. Further treatment of the ore is similar to the Niederschlema-Albelode mine. Some 800 people work in the Pöhla-Tellerhäuser mine.

Königstein/Elbsandsteingebirge District

The district is located about 20 km southeast of Dresden. Original resources are estimated at 62 million pounds equivalent U_3O_8. Several ore bodies have been mined, including Langenhennersdorf and Leopoldishain near Königstein. Mining grades vary between 0.08 and $0.15\,^{w}/_{o}$ U. Since the district's discovery in 1961, 45 million pounds have been recovered, and the deposits will soon be exhausted.

Geology and Mineralization

Uranium mineralization is of sandstone-type and is concentrated in rollfront-type ore bodies. Host rocks are continental clastic sediments of Cenomanian age deposited in a basin surrounded by granitic and metasedimentary rocks of the eastern Erzgebirge. The geology resembles to a large extent that of the North Bohemian Cretaceous Basin, which hosts large sandstone-type uranium deposits such as Hamr and Straz in Czechoslovakia (see Monthly Report #265, September 1990, pp. 38–39). In effect, the Königstein district is a northern extension of the North Bohemian Basin.

Mining

Conventional underground mining started in 1967. The mines were about 200 meters deep and were served by several shafts. Testing of leaching techniques has been conducted since the 1960s. Since 1983, only underground leaching techniques (chamber leaching) have been applied and all conventional mining abandoned. (See the February 1989 Monthly Report, #246 pp. 22-29, for a description of minewater uranium recovery methods.) Conventional mining produced 37 million pounds equivalent U_3O_8 and leaching over eight million pounds. Conventional mining grades, at a cut-off grade of $0.03\,^{w}/_{o}$ U, were $0.13\,^{w}/_{o}$ U from 1967 to 1971, $0.14\,^{w}/_{o}$ U from 1971 to 1976, and thereafter $0.1\,^{w}/_{o}$ U. Leaching was applied to ore grading up to $0.079\,^{w}/_{o}$, at a cut-off grade of $0.02\,^{w}/_{o}$ U. Leaching capacity is 800 thousand to one million pounds equivalent U_3O_8 per year. The workforce in the Königstein district numbers nearly 1,900 employees.

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Gera-Ronneburg District, Thuringia

The Gera-Ronneburg uranium district was discovered in 1950, and includes several deposits located around the town of Ronneburg. Original resources are estimated at about 520 million pounds equivalent U_3O_8, of which 240 million pounds has been mined. Mining grades are 0.08 to 0.095w/o U at a cut–off grade of 0.03w/o U. Ore is shipped up to 15 km by rail to the Seelingstädt mill.

Geology and Mineralization

Several uranium deposits occur in an area 25 km long and 8 to 15 km wide. The area covers part of a large horst structure composed of Paleozoic sediments intruded by dikes and sills that range lithologically from diabase to porphyrite. The sediments are intensely folded and faulted. A regional fault, the Crimmitschauer Lineament, which vertically displaces the sediments by up to 150 meters, constitutes the NE-boundary of the district.

Mineralization is of strata-controlled, structure-bound (stock-work) type. Uranium minerals fill, coat and impregnate minifractures (joints, cleavages), which are arranged in a stockwork-like pattern within distinct lithologic units. These lithologic units, namely Ordovician shales and limestones, and Silurian carbonaceous-pyritiferous shales, are all cut by diabase. The mineralized sediments dip northward, and crop out in the southern part of the district. Ore is found from the surface down to 300 meters. Ore bodies at the northern end of the district are in excess of 1,000 meters deep.

Figure 3. Gera-Ronneburg District. The 940-meter deep shaft at the Drosen mine.

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Mineralized minifractures are less than 1 mm to 1 cm wide. They form irregular shaped stockwork-type ore bodies 20 to 500 meters long, vary in width from a few meters to few hundred meters, and vary in thickness from less than two meters to 120 meters. In-situ U content ranges from 0.075 to 0.15$^{w}/_{o}$U, at a cut-off grade of 0.03$^{w}/_{o}$ U. Some locally concentrated ore bodies (termed K–Erz) grade as high as 0.2 to 0.5$^{w}/_{o}$ U. Host rocks are altered by silicification, chloritization and dolomitization. A bleached halo, a few centimeters wide, often surrounds mineralized structures.

Principal uranium minerals are collomorphous pitchblende, minor coffinite and sooty pitchblende. They are associated with Fe, Pb, Zn and Cu sulfides, which together constitute less than 1% of the ore. Trace amounts of Co-Ni arsenides also occur. Ore-related gangue minerals are predominantly carbonates, with barite and clay minerals. The carbonates amount to 5% or more of the ore.

Mining

Four former deposits were mined by open pits to a depth of 250 meters. All other deposits have been exploited by underground workings, served by about 25 shafts.

Presently four underground mines are in operation:

Mine	Start	Capacity (mill. tonnes/yr)	Mining grade ($^{w}/_{o}$ U)	Mining depth (meters)
Drosen	1982	0.8-1.2	0.072-0.08	720
Paitsdorf	1963	1.0	0.078-0.085	525
Schmirchau	1950	0.8	0.077	570
Beerwalde	1974	0.5	0.074-0.083	600

Drosen is the largest mine, and operates in an oval area 4 km long and 1.5 km wide. Ore occurs at a depth between 540 and 1040 meters below surface. In-situ ore grade averages 0.085$^{w}/_{o}$ U. Mining losses are approximately 20%. Four 940-meter deep shafts provide access to the ore. The deepest present mining is at a depth of 720 meters. The mining method is sublevel stoping with downward extraction of slices four meters thick. Productivity is about 6 cubic meters per man per shift (6 hour shift). One of the main problems encountered at the mine is smoldering (low-temperature burning), which is caused by the reactions of pyrite and organic matter when exposed to oxygen by mining. Stoped intervals are refilled with self-solidifying fill introduced through boreholes. Fill material is lean concrete with lignite filter-ash used as a binder. Hardening takes an average of 14 days.

Conclusion

The productivities seen in these mines (Aue: 250 pounds U_3O_8 per man-year; Königstein/Elbsandsteingebirge: 500 pounds U_3O_8 per man-year) are very low by western standards. The Panel and Quirke mines of Canada's Elliot Lake district, which were closed in 1990 because of high costs, had productivities in the range of 3,000 pounds U_3O_8 per man-year. If the mines of Wismut cannot match western mines in terms of manpower productivity, they are unlikely to be competitive in the world market in the long term.

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1990 EXPLORATION AND DEVELOPMENT IN NORTH AMERICA

The North American continent is the largest uranium producing and exporting area in the world. Despite the effects of record low market prices, uranium exploration continues, as evidenced by some exploration and definition drilling, and assessment drilling.

Canada

CAMECO, operator of Key Lake, the largest uranium production complex in the world, has an ongoing, but limited, exploration program. In 1990, this program consisted of less than 50 holes, but proved a 200 million pound, high-grade U_3O_8 deposit at McArthur River in the Athabasca Basin of northern Saskatchewan. This deposit is only 40 miles northeast of the existing Key Lake mill complex and will provide the resources for processing at Key Lake well into the 21st Century.

Further north, Denison Mines Ltd. completed its test mining program at the Midwest project during 1989. During 1990, Denison removed its equipment from the site and allowed the mine to flood. The test mining was a technical success, with the extraction accomplished using large diameter holes drilled from mine workings just above the deposit. The economic implications of the tests are still being studied and have not yet been announced. Denison is currently going through a corporate reorganization, which may delay any further activities at the project.

In the same area, Minatco, a subsidiary of TOTAL of France, acquired full ownership of the McClean Lake prospect, now renamed the Wolly Project. Feasibility work has been started and permitting activity could start this year. Newly-defined zones north and east of the main McClean Lake occurrence will likely be mined first, using open pit techniques, while the 160-meter-deep McClean deposit is considered an underground site.

A few hundred miles to the northeast, near the west shore of Hudson Bay, is the Thelon Basin, which is very similar geologically to the Athabasca Basin. Several firms were active in the district to some degree in 1990; Urangesellschaft (UG) of Germany, PNC Exploration (Canada) Co. Ltd. (Japanese parent company), and Power Resources Inc. (formerly CEGB Exploration, Inc. of the United Kingdom). The most active company in the Thelon Basin has been UG. UG plans to exploit the Kiggavik Project's 45 million pounds of reserves from two open pits over a period of eleven years. But this project has several factors slowing its progress, including poor market conditions and Native American land claims in the area. UG has recently withdrawn its permit application for the project.

United States

Five firms, Uranium Resources Inc. (URI), Power Resources Inc. (PRI), TOTAL Minerals, Ferret Exploration of Nebraska, and UP Resources, did the bulk of exploration/feasibility work in the USA during 1990. Notably, only UP Resources was working on a conventional mining project; all of the others were pursuing in-situ leaching (ISL) projects.

URI has two projects located in South Texas. URI initiated production at its Rosita Project at a rate of about one million pounds U_3O_8 per year, while it maintained a similar annual capacity on standby at Kingsville Dome. URI continues to examine other targets, mainly in the Goliad Formation, the host for both Kingsville Dome and Rosita. URI also has two projects in New Mexico, Churchrock and Crown Point, with total recoverable resources exceeding 25 million pounds U_3O_8. URI is making significant progress toward permitting these two projects.

PRI is a wholly-owned subsidiary of Nuclear Electric, Great Britain's public nuclear power agency. In late 1990, PRI was successful in acquiring the Gas Hills properties of the Tennessee Valley Authority. This acquisition expands PRI's reserve base in central Wyoming to over 40 million pounds U_3O_8.

UP Resources continued drilling in northern Arizona with two rigs for most of the year. This program, a joint venture of UP Resources and Taiwan Power, is exploring and evaluating breccia pipe deposits. The joint-venture announced in 1990 that the Sage deposit was ready for development.

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TOTAL and Electricité de France (EdF) formed a new company named Fuel International Trading Corporation (FITCO), which, through a complex transaction, acquired the uranium-related assets of Malapai Resources. This acquisition gives FITCO significant resources and in-situ leach production facilities both in Texas and Wyoming. These facilities, in combination with TOTAL's operations (the West Cole project and a 45% interest in the Rhode Ranch open-pit mine), give FITCO a potential production capacity of several million pounds per year. Actual production in 1990 was about 1.5 million pounds equivalent U_3O_8. One new in-situ project, Alta Mesa, is in the permitting phase in Brook County, Texas.

Ferret Exploration is operator and part-owner of the Crow Butte ISL Project in northwest Nebraska. Well field development has been completed and the plant is nearly finished. Start-up is scheduled for early 1991 at a rate of 500 thousand pounds per year. The full capacity of one million pounds per year is not expected to be utilized until the market improves. Limited drilling has continued the definition of the main Crow Butte Trend to the north. Additionally, a second trend, Three Crows, has been defined about ten miles west of the new plant. Some drilling was also conducted on the Big Red deposit, south of the plant.

Other notable uranium activities in the USA involved Kennecott Corporation, Rio Algom Mining Corporation, and Uranerz. Kennecott, a subsidiary of RTZ, purchased a 50% interest in the Green Mountain, Wyoming project from US Energy. The joint-venture partners are evaluating alternative mining techniques for this deep deposit in the Battle Spring formation. Rio Algom, also a subsidiary of RTZ, is in the process of permitting its Smith Ranch, Wyoming, ISL project for a proposed capacity of two million pounds per year. Also in 1990, Uranerz received NRC permits for its Ruth and North Butte ISL projects.

North American Drilling Statistics

The average drill count in the US was about 10 per month in exploration and 14 in development. About twice as many rigs operate during the summer and fall, compared to winter and spring. In Canada, the reverse is true, with two-thirds of the drilling done in the winter when the ground and lakes are frozen. During the winter of 1989–1990, the maximum rig count reached fifteen in both the USA and Canada. This surface exploration effort was augmented with an average of five to ten underground drills all year long.

In both Canada and the US, funding for exploration comes increasingly from foreign investors. This event has been generally welcomed by industry and government, and is reflective of the worldwide market that has developed.

Tom Pool
Bob Steele

NUCLEAR INDUSTRY CALENDAR

1991

Feb. 27-28 *Nuclear Safety: The Way Ahead* (SAS Royal Hotel, Brussels, Belgium).
Co-Sponsored by the Belgian Nuclear Society, the British Nuclear Energy Society, and the Insitution of Nuclear Engineers.
Contact: Katie Lye or Louise Coote, IBC Technical Services Ltd; 44-71-236-4080.

March 24-27 *Fuel Cycle Conference '91* (Sheraton Scottsdale Hotel, Phoenix, Arizona).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 *Japan Atomic Industrial Forum Annual Conference* (Tokyo, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 14-17 *INFO '91 Conference* (The Westin Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 14-18 *Third International Conference on Nuclear Fuel Reprocessing & Waste Management* (Sendai, Japan).
Sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, and co-sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 21-24 *International Topical Meeting on LWR Fuel Performance* (Palais des Papes, Avignon, France).
Sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Fragema, BP3021, F69398 Lyon Cedex 03, France; Tel: (33) 74 72 8159; Fax: (33) 74 72 8760.

April 22-25 *JAIF International Conference on Water Chemistry in Nuclear Power Plants* (Fukui, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

May 8-10 *Second International Conference on Transportation for the Nuclear Industry* (Bournemouth, United Kingdom).
Co-Sponsored by the Institution of Nuclear Engineers, the European Nuclear Society, the American Nuclear Society, the Chartered Institute of Transport, and the Institution of Civil Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

May 12-14 *World Nuclear Fuel Market Annual Meeting* (Atlanta, Georgia).
Contact: Donna Cason, World Nuclear Fuel Market; 404-447-1144.

May 14-16 *Annual Meeting on Nuclear Technology '91* (Hotel & Congress Center Maritim, Bonn, Germany).
Sponsored by the Kerntechnische Gesellschaft e.V. and the Deutsches Atomforum e.V.
Contact: INFORUM GmbH, Congress Office JK'91, Heussallee 10, D-5300 Bonn 1, or 0228/507 223.

CALENDAR

1991

June 2-6	***American Nuclear Society Annual Meeting*** (Marriot Orlando World Center, Orlando, Florida). Contact: ANS Meetings Department; 708-352-6611.
June 23-26	***International Conference on Enrichment*** (The Westin Hotel, Washington, DC). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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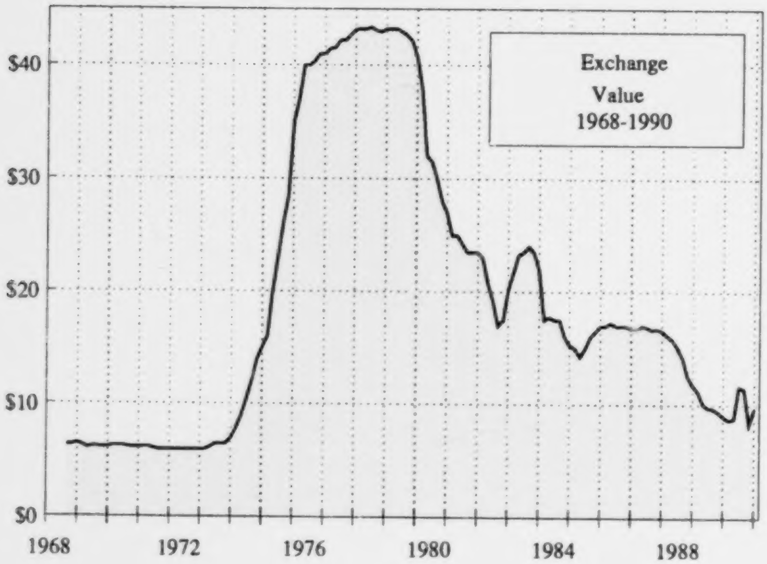
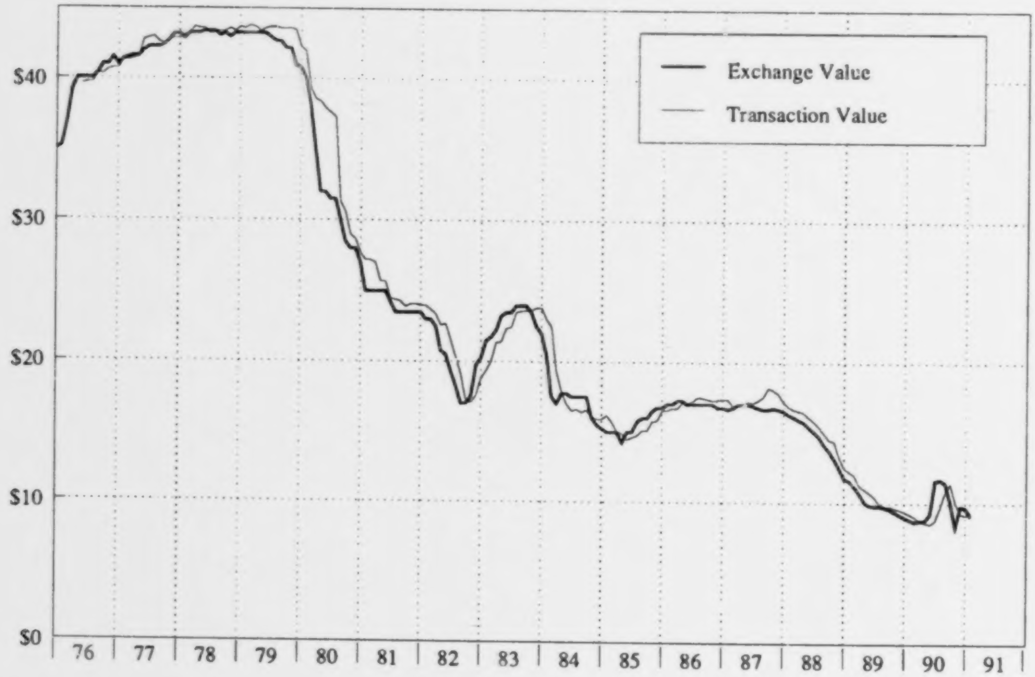
HISTORICAL MARKET DATA

NUEXCO Historical Exchange Value and Transaction Value

(in US dollars per Pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U3O8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	**9.10**											

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U3O8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF$_6$ Values

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	**27.50**											

US Premium (Relative to the UF$_6$ Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	**1.45**											

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HISTORICAL MARKET DATA

Transaction Values

Determined as of the last day of the month indicated ($US/lb U3O8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.[illegible]0	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	**9.40**											

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	**51**											

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	**3.50**											

* Float with Prime Rate

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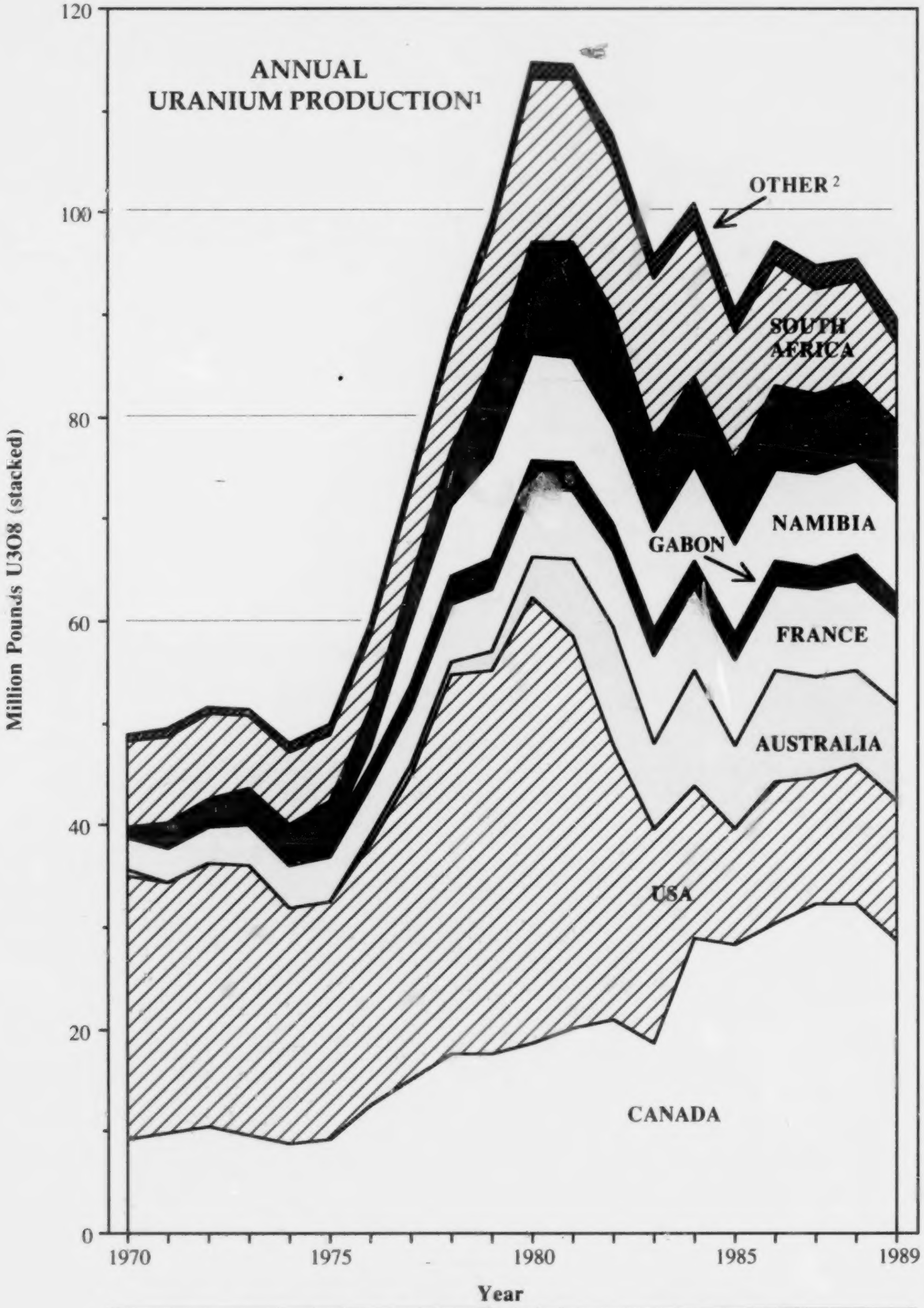

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, (West) Germany, and Yugoslavia

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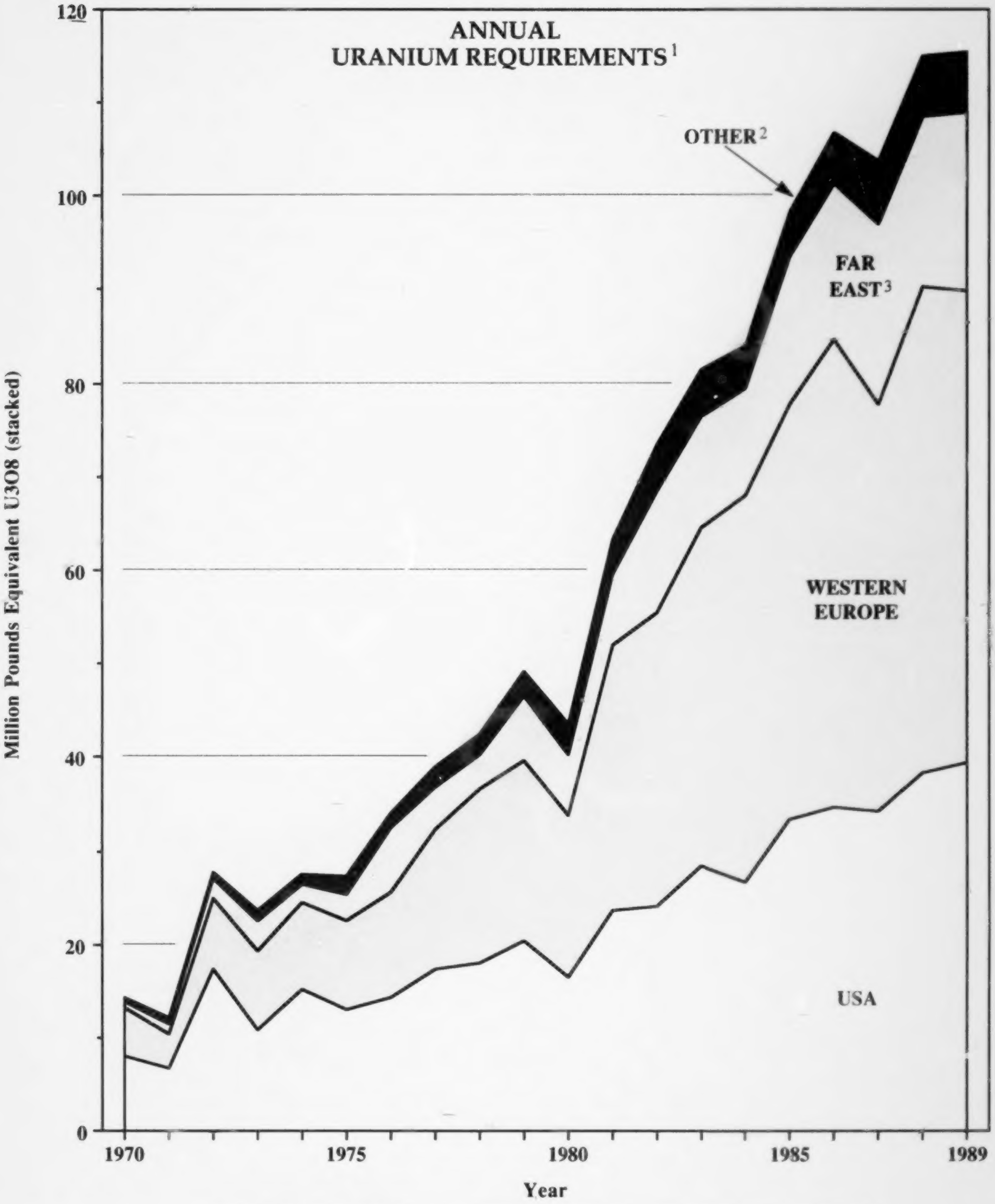

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
Jan	1990	—	119.2	—	128.1
Feb	1990	—	120.8	—	128.1
Mar	1990	204.1	121.5	—	128.3
Apr	1990	—	119.9	—	128.5
May	1990	—	118.9	—	128.8
June	1990	207.4	116.6	—	129.2
July	1990	—	116.4	—	129.4
Aug	1990	—	122.4	—	129.4
Sept	1990	208.9	128.2	—	129.6
Oct	1990	—	134.1	—	—
Nov	1990	—	133.7	—	—

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).
[6] Base: June 1976 = 100.

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Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	—·—	—·—	—·—	—·—	—·—
1981	Avg.	83.4	75.5	—·—	—·—	—·—	—·—	—·—
1982	Avg.	89.0	83.7	—·—	—·—	—·—	—·—	—·—
1983	Avg.	92.1	88.5	17.22	—·—	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	—·—	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	—·—	—·—	—·—	—·—	—·—
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5 **R**	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3 **R**	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6 **R**	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.2	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2 **R**	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6 **R**	121.2	23.11	21.39 **R**	19.12 **R**	14.78 **R**	15.59 **R**
Nov	1990	110.7 **R**	121.9	23.32 **P**	21.71 **P**	19.43 **P**	14.87 **P**	15.73 **P**
Dec	1990	110.5	121.8	—·—	—·—	—·—	—·—	—·—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242 **R**	913,177 **R**
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	668,282	876,527
Oct	1990	—	—	211.1	206.1	—	—
Nov	1990	—	—	215.6	214.9	—	—
Dec	1990	—	—	217.1	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]				Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	—.—	—.—	13.53 **P**	10.37 **P**
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.7	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.3	118.3	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.3	120.8	133.5	—	14.43	14.58 **R**	13.72 **R**	10.47
Nov	1990	120.6	120.1	133.8	—	14.36 **P**	14.77 **P**	13.73 **R**	10.51 **R**
Dec	1990	118.9	118.6	133.8	133.1	—.—	—.—	13.69 **P**	10.59 **P**

P = Preliminary   R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1989: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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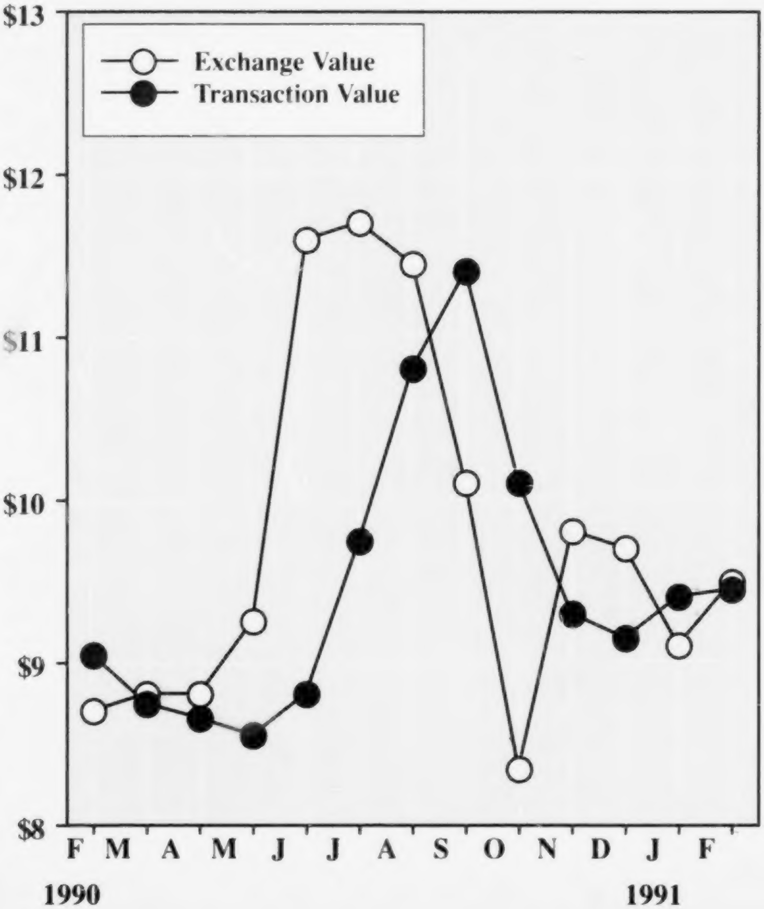

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1991 NUCLEAR FUEL MARKET STUDIES

NUEXCO's annual market study, titled *NUCLEAR FUEL MARKET ANALYSES AND PRICE TREND PROJECTIONS – 1991,* will soon be complete. This edition will provide a comprehensive analysis of the worldwide nuclear fuel market. And, for the first time, information on Eastern Europe and the Soviet Union will be included.

This report, analyzing the entire front-end of the nuclear fuel cycle, is a valuable reference document. Covering the period 1991 through 2005, the study thoroughly discusses the following topics:

- Installed Nuclear Electric Capacity and Performance
- Inflation and Currency Exchange Rates
- Natural Uranium
- Conversion
- Enrichment
- LWR Fuel Fabrication

The study will be available in two versions – *Summary Report* and *Extended Coverage Report* – differing only in the amount of detail provided. The summary report provides regional, aggregated data, whereas the extended report contains specific reactor and production center data.

In the fall of each year, an update to the *Extended Coverage Report* is released. This update includes new and previously unavailable information to revise and augment the spring report.

AVAILABILITY OF THE REPORTS

The reports will be available for release in May 1991.

FOR FURTHER INFORMATION

For additional information, please contact Treva Klingbiel or another
NUEXCO Information Services representative at (303) 899-4500.

NUEXCO Monthly Report

March 1991
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- **Status of Anti-Nuclear Policies Worldwide**

Many obstacles must be overcome in order for nuclear power to be ready for a resurgence. Legislative moratoriums and other formal restrictions have raised some of the biggest obstacles to the recovery of the nuclear power industry. This article presents a country-by-country summary of such policies.

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NUEXCO

To Our Readers

NUEXCO is pleased to announce the opening of our new service location in Sydney, Australia at the offices of our affiliate, CONCORD. The address of this office is as follows:

CONCORD/NUEXCO
9th Floor Kyle House
27-31 Macquarie Place
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Telephone: (61-2) 252-4055
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Mr. Brian L. Harcourt, in such office, serves as Area Director of Operations for Australia for CONCORD and has been involved with CONCORD's semi-conductor activities for several years. He has a background in banking and finance and was Chief Executive Officer of Western Underwriters Pty. Limited, a leading Western Australia insurance and finance group. His corporate experience includes finance, property development, insurance underwriting, international business, and company development. His most recent position has been as Co–founder and Chairman of Ramtron Holdings Limited, an international semiconductor manufacturer with manufacturing operations in Colorado Springs and offices in New York and Sydney. Brian's international experience and familiarity with Australian business practices will be utilized by NUEXCO where needed in our service to our Australian customers.

Dr. Peter Solomon will also be representing CONCORD and NUEXCO in Sydney. Dr. Solomon has been involved in the minerals industry for over 30 years and also has a broad consultancy in the general field of technology development and transfer. He received his bachelors and masters degrees from Queensland University and a PhD from Harvard University. His experience has included both commercial and teaching positions. Peter has worked as a geochemist and research officer for various mining companies, a consultant on mining and technology to government and to private enterprise, and as a advisor to the government on uranium affairs. His work has involved 49 overseas commissions covering 21 different countries. Peter's experience with mineral exploration & development, technology assessment, foreign investment legislation, and worldwide natural resource development policies make him a valued addition to our Sydney office.

NUEXCO is also pleased to announce the following addition to our Denver office:

Mr. Ed Rutkowski has accepted a position with NUEXCO Information Services as a Senior Enrichment Analyst. Ed has over 16 years of experience in the enrichment field and most recently served as DOE's Assistant Manager of European Marketing and Sales. During the past eight years, he has worked in the development of policies, strategies, and activities related to DOE's overall marketing and sale of uranium enrichment services. Prior to this time, Ed worked in DOE's Gaseous Diffusion Operations Branch and the Enrichment Planning Branch.

* * *

NUEXCO will be hosting a hospitality suite at the USCEA Fuel Cycle '91 Conference to be held March 24-27 in Phoenix, Arizona. We look forward to seeing you there.

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In Memoriam

It is with deep sorrow that we must announce the death of John M. Vallance, a Senior Analyst for NUEXCO Information Services. John died suddenly on the morning of February 25 of a heart attack.

John was a truly special person. His years of experience and thorough knowledge of the industry made him an invaluable resource for the company; his caring, friendly nature made him a pleasure to work with. John earned a Chemical Engineering degree from Rensselaer Polytechnic Institute in New York, and a Certificate of Completion from the Oak Ridge School of Reactor Technology. He was the Assistant to the General Manager for Reactor Evaluation for the US Atomic Energy Commission from 1955 to 1967. He then joined the consulting firm of Pickard, Lowe and Garrick from 1967 to 1983 where he was responsible for analyzing all aspects of the fuel cycle, focusing particularly on enrichment. John then accepted the position of president of Colorado Nuclear Corporation, a well-known nuclear industry consulting firm. John joined NUEXCO in 1987, and was responsible for analyzing nuclear power programs worldwide, developing and refining NUEXCO's fuel requirements and reactor database, as well as being a major contributor to NUEXCO's annual Market Study and numerous consulting projects.

John was 60. We join his wife Joan, his three children, one grandchild, and his many friends and colleagues in mourning his death. He will be deeply missed.

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NUEXCO

March 1991
No. 271

MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report February 28, 1991	Last Report January 31, 1991	12 Months Ago February 28, 1990
EXCHANGE VALUE[1]	**\$9.50**/lb equivalent U_3O_8	\$9.10	\$8.70
UF_6 VALUE[2]	**\$27.75**/kg U as UF_6	\$27.50	\$25.25
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.45**/lb U as UF_6	\$1.45	\$1.50
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$50**/SWU	\$51	\$50
TRANSACTION VALUE[6]	**\$9.45**/lb equivalent U_3O_8	\$9.40	\$9.05
Transactions	**18**	18	22
Months	**3**	3	3
Millions of Pounds	**2.6**	3.1	5.8

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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FEBRUARY MARKET REVIEW

(as of February 28, 1991)

OVERVIEW

The uranium market firmed during February, but ample supplies and cautious buyers limited the extent of the price increase. The Exchange Value climbed \$0.40, to \$9.50 per pound U_3O_8. The rise in the concentrates market influenced the UF_6 market, but the February 28, 1991 UF_6 Value rose only slightly, to \$27.75 per kgU as UF_6. Uranium sales volume increased over January's level of just under one million pounds, as 1.8 million pounds equivalent U_3O_8 changed hands in eleven transactions during February (**Table 1**).

The Loan Rate and Conversion Value remained unchanged at 3.5 percent per annum and \$1.45 per pound U as UF_6, respectively. No loans are reported, but three conversion sales totalled over 1.5 million pounds U.

The SWU Value declined one dollar, to \$50 per SWU. Despite some increase in demand, aggressive competition among sellers led to the price decline.

NATURAL URANIUM AND CONVERSION

The **Exchange Value** rose four percent as of February 28, to **\$9.50** per pound U_3O_8. With near-term demand increasing, sellers were less aggressive in their pursuit of new business, allowing prices to move higher. Buyers, however, anxious to avoid a repetition of the mid–1990 price run up, remained generally cautious, which served to moderate the extent of the price rise. Price levels moved up quickly in early February, but buyer and seller behavior led to a leveling of the market during the rest of the month.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	February 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	8	1.2	11	1.7
Natural UF_6	0	0.0	2	0.5
EUP	3	0.7	3	0.7
Total[2]	**11**	**1.8**	**16**	**2.8**

[1] million pounds equivalent U_3O_8
[2] columns may not total due to independent rounding

The eight natural uranium sales reported for February all involved concentrates, and totalled nearly 1.2 million pounds equivalent U_3O_8. Although several buyers considered UF_6, all elected to purchase concentrates. The eight buyers were from the USA; producers made four purchases, utilities made two purchases, and intermediaries accounted for the remaining two. No long-term uranium transactions are reported.

* * *

The **UF_6 Value** rose \$0.25, to **\$27.75** per kgU as UF_6. This small (one percent) increase reflects the influence of the concentrates market on the UF_6 market, as no UF_6 transactions are reported. UF_6 had been selling at a premium to the sum of the values of its components—concentrates and conversion. This month's increase in the Exchange Value was larger than the increase in the UF_6 Value, that is, the market adjusted to this premium, and UF_6 is now selling at a small discount.

UF_6 prices are also being influenced by developments in the market for enriched uranium product (EUP). Activity in the EUP market has increased recently, and consequently, the market for its feed component is affected. The feed component of EUP may be discounted relative to the price for natural UF_6.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	5,375	2,485
• Supply/Demand Ratio:	2.2	
• Loan (thousand lbs equivalent U_3O_8)	9,340	0
• Conversion (thousand lbs U as UF_6)	920	630
• SWU (thousand SWUs)	575	340

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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The **Transaction Value** increased slightly, rising $0.05, to **$9.45** per pound U_3O_8 based on 18 transactions over 3 months involving 2.6 million pounds equivalent U_3O_8. Compared to the volatility of the past year, prices in the last few months have not exhibited extreme price swings. The Exchange Value for the past four months has moved within a $0.70 range. This relative stability has led to a convergence of the Exchange Value and the Transaction Value.

* * *

Active uranium supply remained essentially stable, increasing by only 175 thousand pounds, to **5.4** million pounds equivalent U_3O_8 (**Table 2**). **Active uranium demand** increased more noticeably, growing from 1.6 million to **2.5** million pounds equivalent U_3O_8. The increase in demand resulted in a decline of the **supply-demand ratio** to **2.2**.

* * *

Table 3
ENRICHMENT PRICES
(February 28, 1991)

Prices	This Month Report 271	Last Month Report 270	12 Months Ago Report 259
NUEXCO SWU Value ($US per SWU)	50	51	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U_{235}	201	198	193
2.5 w/o U_{235}	277	274	266
3.0 w/o U_{235}	355	352	342
3.5 w/o U_{235}	435	431	420
4.0 w/o U_{235}	516	512	498
4.5 w/o U_{235}	598	593	578

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

The **Loan Rate** remained at **3.5** percent per annum. No loans are reported for February. Loan supply decreased slightly from last month's record level, but still remains above nine million pounds (**Table 2**).

* * *

The **Conversion Value** remained at **$1.45** per pound U as UF_6, unchanged for an entire year. Activity increased in the conversion market in the past month as an influx of demand has drawn out suppliers. Three conversion transactions are reported. The sales, all from US sellers, involved a total exceeding 1.5 million pounds U. One of the sales was for near-term delivery; the others called for deliveries during the period 1991-1992.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** fell one dollar, to **$50** per SWU. Although demand remained relatively high, with some new buyers entering the market during the month and several utilities evaluating offers, aggressive competition among sellers led to the price decline. At least eight buyers were evaluating offers at month end—nearly all reported that they had received several competitive offers. Four more utilities are expected to begin evaluating offers in March.

Three EUP transactions are reported for February. The sales involved nearly 700 thousand pounds equivalent U_3O_8 and almost 150 thousand SWU. Two utilities and a fabricator made the purchases from intermediary sellers.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5044	1991	101-300	98-102	Intermediary	Intermediary	
5045	1991	Less Than 50	90-97	Producer	Intermediary	
5046	1991	Less Than 50	90-97	Producer	**R**	
5047	1991	50-100	90-97	Producer	Intermediary	
5048	1991	101-300	**R**	Producer	**R**	
5049	1991	101-300	98-102	Intermediary	Intermediary	
5051A	1991	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5054	1991	101-300	98-102	Utility	Producer	
5055A	1991	301-600	See Remarks	Utility	Intermediary	Contained in EUP
5056A	1991	Less Than 50	See Remarks	Fabricator	Intermediary	Contained in EUP
5057	1991	101-300	98-102	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
No Loans Are Reported						

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5039	1991-1992	1,001-3,000	R	R	Converter	
5050	1991-1992	101-300	98-102	Intermediary	Utility	
5052	1991	50-100	Above 110	Utility	Intermediary	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5051B	1991	50-100	See Remarks	Utility	Intermediary	Contained in EUP
5055B	1991	50-100	See Remarks	Utility	Intermediary	Contained in EUP
5056B	1991	Less Than 50	See Remarks	Fabricator	Intermediary	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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NUEXCO

MARKET REVIEW

SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A	700	1,045 per year	1991-1993	UF_6e
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1249	500	—	1991	
90-1501*	3,000	1,000 per year	1991-1995	U_3O_8/UF_6
91-1056*	75	—	1991	
91-1060*	100	—	1991	
Total	**5,375**			
INACTIVE	**4,100**			
AVAILABLE FOR LOAN:				
ACTIVE				
88-1182	4,400	—	U_3O_8/UF_6	
90-1016	1,000	—	U_3O_8	
90-1230	1,000	—	U_3O_8	
90-1260	1,000	—	UF_6	
90-1275	100	—	U_3O_8	
91-1009*	340	—	U_3O_8	
91-1018	500	—	U_3O_8	
91-1034*	1,000	—	U_3O_8	
Total	**9,340**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1108, 90-1180, 91-1007

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100A	45	—	1991	UF_6e
90-1289*	210	—	1991	
91-1003A	750	—	1991	UF_6e
91-1029A	10	—	1991	UF_6e
91-1037*	25	—	1991	
91-1040*	525	—	1991-1992	UF_6
91-1045*	120	—	1991	
91-1048*	400	—	1991	U_3O_8/UF_6
91-1061*	400	—	1991	
90-1291	—	100 per year	1991-1995	
91-1014A	—	6,800	1992-2001	UF_6e
91-1017	—	300 per year	1995-2000	
91-1038*	—	130 per year	1992-1996	
91-1054*	—	1,200	1992-1997	
Total	**2,485**			
INACTIVE	**2,565**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

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* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 90-1170, 90-1239A, 90-1240, 90-1256, 90-1267, 90-1293, 91-1013

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years [1]	Beyond 3 Years [1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1033	220	—	1991	
91-1500*	300	—	1991	
91-1501*	400	—	1991	
Total	**920**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1003C	630	—	1991	
Total	**630**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

SWU Supply And Demand

	Quantity (Thousand SWUs)			
NUEXCO Project Number	**Spot or Near-term**[1]	**Intermediate or Long-term**[2]	**Delivery Period**	**Remarks**
AVAILABLE FOR SALE:				
ACTIVE				
88-1006	150	—	1991	
90-1078B	200	435 per year	1991-1993	UF$_6$e
91-1008*	75	—	1991	
91-1032	150	—	1991	
90-1500*	—	1,000	1991 on	
Total	**575**			
INACTIVE	**500**			
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100B	15	--	1991	UF$_6$e
90-1224	40	100 per year	1991-1995	
91-1003B	170	—	1991	UF$_6$e
91-1023	60	120	1991-1995	
91-1029B	5	—	1991	UF$_6$e
91-1057	50	—	1991	
90-1094	—	500	1992-2000	
90-1181*	—	1,500	1996-2001	
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	
91-1014B	—	1,770	1992-2001	UF$_6$e
91-1027	—	55 per year	1996-2000	
91-1028	—	125	1995-1996	
Total	**340**			
INACTIVE	**340**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1010B

Active Projects removed since last month: 90-1076, 90-1144, 90-1239B, 91-1001, 91-1025

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**
Australia (dollar)	12.10	11.59	11.47	31.46	30.14	29.82
Belgium (franc)	297.62	280.09	306.01	773.74	728.16	795.57
Canada (dollar)	10.94	10.57	10.39	28.44	27.47	27.01
EC (ecu)	7.06	6.63	7.19	18.36	17.23	18.68
Finland (markka)	34.84	32.87	34.51	90.58	85.44	89.73
France (franc)	49.18	46.04	49.69	127.86	119.68	129.19
Germany (mark)	14.46	13.57	14.68	37.60	35.27	38.15
Italy (lira)	10,802	10,171	10,860	28,082	26,442	28,234
Japan (yen)	1,254	1,195	1,293	3,261	3,106	3,362
Netherlands (guilder)	16.30	15.25	16.54	42.37	39.65	43.01
So. Africa (comm. rand)	24.39	23.18	22.21	63.41	60.26	57.73
So. Korea (won)	6,812	6,525	6,082	17,708	16,963	15,813
Spain (peseta)	900.13	847.69	944.42	2,340	2,204	2,455
Sweden (krona)	53.64	50.61	53.08	139.46	131.58	138.00
Switzerland (franc)	12.50	11.52	12.91	32.50	29.96	33.55
Taiwan (dollar)	253.65	242.29	229.92	659.44	629.91	597.75
UK (pound)	4.95	4.64	5.15	12.88	12.07	13.38
US (dollar)	9.50	9.10	8.70	24.70	23.66	22.62

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**
Australia (dollar)	12.04	11.97	11.93	31.30	31.13	31.02
Belgium (franc)	296.05	289.32	318.33	769.67	752.17	827.58
Canada (dollar)	10.88	10.91	10.81	28.29	28.37	28.09
EC (ecu)	7.02	6.85	7.48	18.26	17.80	19.43
Finland (markka)	34.66	33.95	35.90	90.10	88.26	93.34
France (franc)	48.92	47.55	51.69	127.19	123.63	134.39
Germany (mark)	14.39	14.02	15.27	37.40	36.44	39.69
Italy (lira)	10,745	10,506	11,297	27,934	27,314	29,370
Japan (yen)	1,248	1,234	1,345	3,244	3,209	3,498
Netherlands (guilder)	16.21	15.76	17.21	42.15	40.96	44.74
So. Africa (comm. rand)	24.26	23.94	23.10	63.08	62.25	60.05
So. Korea (won)	6,776	6,740	6,357	17,615	17,522	16,528
Spain (peseta)	895.40	875.64	982.41	2,328	2,276	2,554
Sweden (krona)	53.36	52.28	55.22	138.72	135.92	143.55
Switzerland (franc)	12.44	11.90	13.43	32.33	30.95	34.90
Taiwan (dollar)	252.32	250.28	240.32	655.97	650.67	624.77
UK (pound)	4.93	4.79	5.36	12.81	12.47	13.92
US (dollar)	9.45	9.40	9.05	24.57	24.44	23.53

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[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

	per lb U as UF_6			per kg U as UF_6		
Country (currency)	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**
Australia (dollar)	[illegible]	1.85	1.98	4.07	4.07	4.36
Belgium (franc)	[illegible]	44.63	52.76	100.15	98.39	116.32
Canada (dollar)	[illegible]	1.68	1.79	3.68	3.71	3.95
EC (ecu)	[illegible]	1.06	1.24	2.38	2.33	2.73
Finland (markka)	5.32	5.24	5.95	11.72	11.55	13.12
France (franc)	7.51	7.34	8.57	16.55	16.17	18.89
Germany (mark)	2.21	2.16	2.53	4.87	4.77	5.58
Italy (lira)	1,649	1,621	1,872	3,635	3,573	4,128
Japan (yen)	191.47	190.39	222.98	422.12	419.74	491.59
Netherlands (guilder)	2.49	2.43	2.85	5.48	5.36	6.29
So. Africa (comm. rand)	3.72	3.69	3.83	8.21	8.14	8.44
So. Korea (won)	1,040	1,040	1,031	2,292	2,292	2,273
Spain (peseta)	137.39	135.07	162.83	302.89	297.78	358.98
Sweden (krona)	8.19	8.06	9.15	18.05	17.78	20.18
Switzerland (franc)	1.91	1.84	2.23	4.21	4.05	4.91
Taiwan (dollar)	38.72	38.61	38.97	85.35	85.11	85.91
UK (pound)	0.76	0.74	0.89	1.67	1.63	1.96
US (dollar)	1.45	1.45	1.50	3.20	3.20	3.31

SWU Value And UF_6 Value[1]

	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
Country (currency)	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31, 1991)**	**12 Months Ago (Feb. 28, 1990)**	**This Month (Feb. 28, 1991)**	**Last Month (Jan. 31,1991)**	**12 Months Ago (Feb. 28, 1990)**
Australia (dollar)	63.69	64.97	65.92	35.35	35.03	33.28
Belgium (franc)	1,566	1,570	1,759	869.36	846.41	888.14
Canada (dollar)	57.58	59.21	59.70	31.96	31.93	30.14
EC (ecu)	37.16	37.15	41.30	20.62	20.03	20.85
Finland (markka)	183.37	184.19	198.35	101.77	99.32	100.16
France (franc)	258.85	285.01	285.60	143.66	139.12	144.22
Germany (mark)	76.12	76.04	84.35	42.24	41.00	42.59
Italy (lira)	56,850	57,002	62,414	31,552	30,737	31,519
Japan (yen)	6,602	6,696	7,433	3,664	3,611	3,754
Netherlands (guilder)	85.78	85.48	95.08	47.61	46.09	48.01
So. Africa (comm. rand)	128.37	129.90	127.62	71.25	70.05	64.44
So. Korea (won)	35,850	36,567	37,113	19,897	19,718	17,801
Spain (peseta)	4,738	4,751	5,428	2,629	2,562	2,741
Sweden (krona)	282.33	283.95	305.06	156.69	152.95	154.05
Switzerland (franc)	65.80	64.59	74.17	36.52	32.83	[illegible]
Taiwan (dollar)	1,335	1,358	1,403	740.93	732.20	672.88
UK (pound)	26.07	26.01	29.59	14.47	14.03	14.94
US (dollar)	50.00	51.00	50.00	27.75	27.50	25.25

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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RECENT DEVELOPMENTS

JAPAN

Mihama 2 Incident May Slow Japan's Nuclear Growth

The Mihama 2 nuclear unit, a 470-MWe (net) PWR owned and operated by Kansai Electric Power Corporation of Japan, suffered an automatic shutdown on February 9. The incident was Japan's first necessary activation of its emergency core cooling system (ECCS), and was the country's most severe incident in its nearly 30 years of nuclear power plant operation. The event rated as a level 3 on the Japanese scale, but would only be rated at a level 1 or 2 on the International Atomic Energy Association's nuclear accident severity scale (a rating of 1 is the least severe; a 7 is the highest-severity rating). A rupture of a tube in the steam generator caused the incident.

The incident has garnered significant press coverage, which may hinder the government's plans to build 40 additional nuclear plants over the next 20 years (NUEXCO Monthly Report #263, July 1990, p.19). Government and utility officials fear that the extensive press coverage, including many inaccuracies, may provide anti-nuclear groups with enough attention to enlist sufficient public support to slow or even stop plans for many of the proposed additional plants.

Numerous early reports of the incident claimed operator error, equipment malfunctions, and serious releases of radioactivity. Later, detailed reports of the incident show that operators followed standard procedures and reacted promptly.

The staff noticed slight level changes in the readings of secondary circuit monitoring equipment for the steam generator at 12:40 pm, and immediately proceeded with water samplings to test for radioactivity leaks. Kansai's established procedure calls for the tests to be performed twice for verification. While the second test was being performed, less than one hour after the initial changes in monitor readings, an alarm sounded that radioactivity had suddenly jumped past the triggering level of 2.5 times the normal operation setpoint. Five minutes later, while the staff was beginning a manual shutdown of the reactor, a second alarm sounded. A few minutes later, a sudden drop in primary coolant pressure triggered the automatic shutdown of the reactor and the operation of the ECCS.

The only emergency equipment failure was a pressure relief valve that failed to respond when operators signalled it to open, following their isolation of the steam generator. Within ten minutes of the initial alarm, all releases of radioactivity to the atmosphere had been stopped. Reports on the amount of radioactivity released ranged from the equivalent of a few days of operation to one year's worth of operation, and none of these levels are considered significant or harmful to the environment. Local citizen groups monitoring the area immediately after the incident detected no significant increases in radioactivity. Within 20 minutes of the first alarm, Kansai officials began notifying national and government agencies of the incident.

The USA and France do not even rate steam generator tube ruptures at as severe an incident level as the Japanese. Japan also has some of the strictest inspection programs for these tubes in the world—100 percent of the tubes are inspected every 13 months. Nevertheless, the Japanese government and industry have already initiated procedural changes for inspections, immediate precautionary inspection of similar plants, and two extensive studies of the incident.

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RECENT DEVELOPMENTS

USA

US National Energy Strategy

The Bush Administration released its National Energy Strategy (NES) at a special White House ceremony on February 20th. The product of over 18 months of hearings and analysis, the NES is designed to encourage diversification of US energy sources and more efficiency and flexibility in energy consumption. The plan relies on market forces, rather than government intervention to achieve its goals, thus, many critics are skeptical about the NES's political viability. Environmentalists are critical of provisions in the plan to open the Alaska National Wildlife Refuge (ANWR) to oil exploration, and the de-emphasis on conservation and energy efficiency programs. Amid this controversy, the nuclear sections of the strategy have largely been ignored by the critics. A legislative package implementing the NES has been sent to Congress. Congress will consider this bill, along with other omnibus energy bills already before Congress, as the framework for a US energy policy. Highlights of the plan related to utilities include proposals to:

- amend the Public Utility Holding Company Act (PUHCA) to allow power suppliers to build, own and operate power facilities in more than one area;
- support state and utility efforts to invest in energy efficiency as an alternative to power plant additions;
- reform the Public Utility Regulatory Policies Act (PURPA) to modify size and fuel use restrictions for small power producers;
- expand access to electricity transmission for utility and non-utility wholesale buyers and sellers.

As part of the legislation sent to Congress, the Administration proposed changing the Federal Energy Regulatory Commission's (FERC) status from an independent agency to a program within DOE. DOE projects these and other recommendations will reduce electricity demand growth by over 10% in 2010 and save consumers $27 billion. Concerning nuclear power, the NES proposes:

- streamlining the nuclear plant licensing process, as well as the process for siting and licensing spent fuel facilities;
- developing standardized designs for advanced LWRs;
- concentrating R&D on passively-safe reactors.

If the recommendations are approved, DOE projects that nuclear power production could increase 10% over previous projections for 2010. The most controversial section of the nuclear portion of the NES is a proposed change to the Nuclear Waste Policy Act. The changes will speed up the siting process for the spent fuel repository at Yucca Mountain, Nevada by removing a requirement for the state and local permits currently needed to proceed with site characterization. The state of Nevada and its Congressional delegation have already written a letter claiming such a change "subverts the democratic process and threatens the foundation of state-federal relations."

In addition to the administration's energy proposal, Congress has a number of ideas for creating an energy policy. Chairman of the Energy & Natural Resources Committee, Sen. J. Bennett Johnston (D-LA), and ranking minority member Malcolm Wallop (R-WY), have introduced the National Energy Security Act (S 34). This bill incorporates many of the same recommendations as the NES, while calling for more energy efficiency with plans to reestablish CAFE (Corporate Average Fuel Economy) standards. An omnibus energy bill will most likely be enacted by this Congress.

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WASHINGTON FOCUS

by Linda L. Gunter

The Bush administration released its budget at the beginning of February, and the National Energy Strategy was issued near the end of the month. Both documents illustrate an effort by the administration to promote science and technology without formally creating an industrial policy. Increased funding will translate into more federal government resources for basic science and advanced research, as well as more programs for technology transfer from government laboratories to the private sector. If Congress approves the budget, overall civilian research and development spending will increase 13 percent, and basic science research by 8 percent. While the majority of R&D funding is still allocated to defense projects, support for civilian programs such as fusion research will increase by 23 percent, to $337 million, and agencies supporting basic science, such as the National Science Foundation and the National Institutes of Health, will increase their budgets by 18 percent and 7 percent, respectively. Considering the government's overall budget constraints (fund increases in one program must be offset by cuts in other programs) this is a significant commitment to science and education.

FY 92 Budget

◇ DOE's budget increased to $18.6 billion, primarily reflecting the growing costs of cleaning up the nation's defense weapons sites. DOE's FY92 budget request for nuclear programs is $2.6 billion, a $300 million increase from FY91. The light water reactor program will receive $62.5 million; $49.5 million has been requested for advanced reactor R&D. Within this budget category, $20 million has been ear-marked for a "first-of-a-kind" cost-shared engineering program designed to achieve standardization of a nuclear plant by 1995.

The NRC's budget expanded, due to a new law requiring 100 percent of the budget be collected in user fees. Based on a FY92 budget request of $512.5 million, utility user fees could triple to an average of $3 million per reactor. Reactor safety and safeguards regulations programs will grow by over $10 million, from $188 million in FY91 to $199 million in FY92. Nuclear safety research also received approximately a $10 million increase. The nuclear material/low level waste safety and safeguards office receives a $1.3 million increase. According to budget documents, the NRC plans 200 additional inspections of material licensees, and continued review of the adequacy of the decontamination of nuclear materials and fuel cycle facilities. If this budget is approved, the NRC will increase its staff by 100.

Activities mandated by the new Clean Air Act Amendments will increase the Environmental Protection Agency's (EPA) budget by 2.7 percent; seventy percent of that increase will be devoted to enforcing this new law. For example, the FY92 request for air quality programs increases by $117 million, to $512 million. The Office of Radiation Programs budget request also increases slightly, to $39.6 million with an emphasis on reducing radon exposure, and $6.3 million for implementation of radiation standards.

NESHAP Impact on Nuclear Industry Reduced

◇ On February 15, the EPA issued a notice of its intent to stay, and eventually rescind, a section of its National Emission Standards for Hazardous Air Pollutants for Radionuclide Emissions (NESHAPS) which is applied to NRC licensed facilities. Under a provision of the Clean Air Act Amendments which Sen. Alan Simpson (R-WY) sponsored, the EPA can determine that NRC regulation was sufficient to protect the public health and safety. This notice removes nuclear power plants from most EPA regulation, but unfortunately does

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not resolve questions the uranium mining industry has raised on other sections of the rule, specifically in Subparts T & W. Operators of uranium mill tailing sites must be in compliance with Subpart T by December 15, 1991. Although the EPA recognizes it is impossible for operators to meet this deadline for compliance, the EPA has not stayed that portion of the rule.

IP III Proposal

◇ Although the Office of Management & Budget (OMB) has halted DOE's attempt to offer customers an Incentive Price III proposal, DOE officials did succeed in winning a concession. DOE cannot formally announce IP-III, but it hopes to have legal authority to negotiate IP-III like prices (and other areas where it can be flexible) with individual utilities on a case-by-case basis. DOE's position is that it already has the authority to make these offers based on the revised criteria published in 1986, which allows DOE to deal with customers that are similarly situated on an individual basis. Thus, it may be able to accomplish its goal despite OMB resistance.

DOE Awards Repository, M & O Contract to TRW

◇ On February 13, DOE awarded the $1 billion systems engineering, development, and management contract for the civilian spent fuel repository at Yucca Mountain, Nevada to TRW Environmental Safety Systems (TESS). The initial award is $15.8 million for the first six months, with an option to renew for an additional five years. DOE originally awarded the contract to Bechtel System Management Inc., but the US Claims Court in Washington, DC ruled in 1989 that DOE violated conflict-of-interest laws when it made the award and permanently barred Bechtel from receiving the contract. TESS will coordinate a team of subcontractors which include Duke Engineering, Babcock & Wilcox, and Fluor Daniel among others. They are responsible for all systems engineering at Yucca Mountain as well as licensing and quality assurance for a Monitored Retrievable Storage (MRS) facility. DOE's budget request for the high-level nuclear waste program is $305.1 million, approximately a $62 million increase over FY91. Included in the figure is $32.2 million for MRS siting and preliminary design activities.

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INDUSTRY BRIEFS

Energy Fuels Announces Joint Venture

On January 16, 1991, John Adams, Chairman of Energy Fuels, and Oren Benton, owner of NUEXCO, announced a joint venture involving all of the uranium operations of Energy Fuels. Energy Fuels, which was founded in 1972, has been the largest US uranium producer since 1986. The company holds over 20 million pounds of uranium reserves located in Mojave county, Arizona.

Mr. Benton and the Adams family will have equal interests in Energy Fuels' uranium operations. Mr. Adams and Mr. Benton will serve as co-chairmen of Energy Fuels, with Mr. Adams continuing to direct its day-to-day operations. Mr. Benton was associated with Energy Fuels as Vice-Chairman prior to his purchase of NUEXCO.

The parties have stated that the companies will remain separate participants in the nuclear fuel industry, cooperating where appropriate to strengthen each as a trading organization and as a producer.

Bids Out For Two-Unit Nuclear Station In Czechoslovakia

A consortium of Czechoslovakian enterprises has requested bids for the design and construction of two 1,000 to 1,400 MWe nuclear power plants. The enterprises forming the consortium are Energoprojeckt, Ceske Energeticke Zavody, Slovenske Energeticke Podniky, Ceskoslovensky Uranovy Prumsyl Koncern, and a representative for the Czechoslovak Atomic Energy Commission. The initial requests were sent to Asea Brown Boveri, General Electric, Mitsubishi, Nuclear Power International, Westinghouse, and the Czech firm of Skoda. The second unit can be bid as an option. The consortium's bid request asks for either PWR or BWR designs, and is receptive to alternative designs, including passively-safe units. The Czechoslovakian government expects to decide on the site for the two units later this year.

China Releases New Information On Nuclear Power Plans

Jiang Xinxiong, President of China National Nuclear Corporation, provided further details of China's nuclear power plans at a conference in Beijing earlier this year. China plans to have six commercial nuclear power plants in operation by 1994, with an output of at least 2,100 MWe (gross).

The plan has three phases. The first phase includes the start-up this year of Qinshan, China's first commercial nuclear power plant (300 MWe gross; its first domestically-produced nuclear plant), and the next year's start-up of the 900 MWe (gross) Daya Bay reactor. The second phase includes a second, matching unit at Daya Bay by 1993, and a matching 300-MWe unit plus two 600-MWe units at Qinshan by 1993-1994. The third phase includes an unspecified number of new plants by the year 2000 to raise nuclear-power-generated electricity to over 6,000 MWe.

Mr. Jiang also stated that China plans to increase total electrical generation from all sources to 810 billion kWH by 1996, up from the current level of 615 billion kWH.

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Queensland Government Opposes Uranium Mining

A recently-released report from the government of the Australian state of Queensland indicated that uranium mining is not part of Queensland's long-term energy policy. It is not clear in what manner the government would prohibit uranium mining. None of Australia's major deposits are located in the state of Queensland, so this report is unlikely to affect the country's current uranium operations. However, the timing of the report's release may be prompted by the upcoming July 1991 conference of the Australian Labor Party. That conference plans to examine, and possibly modify or eliminate, the existing "three mines policy."

India Marketing Nuclear Power Technology

The government of India has approved its Atomic Energy Commission's (AEC) plan to market technology and products for nuclear power plants. Government approval came when the marketing plan was accompanied by a plan to report the details of all transactions to the IAEA, even though India is not a signatory to the NPT. The AEC's marketing effort is focusing on third-world countries since they do not require, and are least able to afford, sophisticated technology from the major industrialized nations.

Olympic Dam Expansion To Increase Uranium Production

Western Mining Corporation and British Petroleum, owners of Australia's Olympic Dam project, announced that an 18-month, A$66-million expansion program is underway. The completed program will allow uranium production to increase by nearly 16 percent, to 1,400 metric tons U_3O_8 per year (approximately 3.1 million pounds) by mid-1992.

CLARIFICATION

The February 1991 NUEXCO Monthly Report #270 contains an article that requires clarification. The article, titled *North American Exploration and Development in 1990*, contains a paragraph on page 30 that unintentionally implies that Total Minerals has a financial interest in Fuel International Trading Corporation (FITCO). TOTAL, a subsidiary of Total Compagnie Française des Petroles, is the operator of the project. FITCO is a wholly-owned subsidiary of Electicité de France (EdF). In a complex transaction (explained in detail in the August 1990 NUEXCO Monthly Report #264, p.14), FITCO acquired the uranium-related assets of Malapai Resources.

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STATUS OF ANTI-NUCLEAR POLICIES WORLDWIDE

Nuclear power may be ready for a resurgence as a viable and clean alternative energy source. However, many obstacles must be overcome for this renewal to occur. Legislative moratoriums and other formal restrictions have raised some of the biggest obstacles to the recovery of the nuclear power industry. This article presents a country-by-country summary of such policies.

EUROPE

Some of the world's strongest national nuclear programs are those of France and Belgium. Yet, Europe has some of the strongest anti-nuclear sentiment and strictest anti-nuclear legislation.

Austria

Austria's socialist government continues to maintain its anti-nuclear posture. Austria's only nuclear power reactor, Tullnerfeld, was 98% complete when it was cancelled in 1978. The reactor was ordered in 1971, and its design and construction proceeded without any undue technical or construction problems, but the plant met with opposition from its inception. In November 1978, the anti-nuclear faction won a national referendum to determine the fate of the plant. By a narrow margin, the project was halted and a moratorium on nuclear power construction enacted.

In the early 1980s, Tullnerfeld was kept on standby as nuclear proponents worked to garner support for the project. By 1985, it appeared that support had grown sufficiently to allow completion and operation of the plant. But, reaction to the early 1986 Chernobyl accident effectively eliminated the nuclear option in Austria. Tullnerfeld is now planned for conversion to a gas-fired power station.

Austria's moratorium on nuclear power construction remains in force. The country has even begun pressuring neighboring countries to close all of their nuclear facilities. In particular, Austria has applied considerable pressure on the government of Czechoslovakia to close its two-unit Bohunice station situated near the Austrian border. Austria has even offered to provide Czechoslovakia with free electricity for 12 months to offset the generating capacity that would be lost if the station were closed.

Belgium

Belgium's seven nuclear power plants generated over 60 percent of the country's electricity in 1990. Despite the success of its nuclear program, Belgium's government rejected a proposal in December 1988 by Belgian utilities to construct an eighth reactor. Rather, the government supported plans for an additional gas-fired plant to meet its growing electricity demand. The government stated that the decision did not eliminate nuclear as an option, and that the decision on the eighth plant will be reviewed in 1995.

Czechoslovakia

Czechoslovakia is one of Eastern Europe's most industrialized nations, and its newly-elected democratic government remains committed to nuclear power. However, pressure from Western countries and from local environmental groups is forcing the government to reexamine its nuclear plans. All of Czechoslovakia's reactors are Soviet-designed, and thus are undergoing close scrutiny by Western agencies. The four-unit Bohunice station (4 x 408 MWe net), near the Austrian border, is under the most pressure. The Czech government is currently analyzing a proposal from Austria that offers free electricity for one year and a US$340 million contribution toward decommissioning costs, in return for Czechoslovakia closing the Bohunice station. Czechoslovakia has neither accepted nor rejected the proposal, although government officials are unlikely to accept the offer. The government wishes to complete its units under construction at other sites, then decide the fate of the nuclear option on a national basis.

The Temelin station is also undergoing scrutiny. Units 1 and 2 are already on line, while units 3 and 4 are still under construction. The Czech government is examining plans to have units 3 and 4 completed using Western technology and to have the entire station backfitted with Western instrumentation and controls (I&C). While local government has no authority in determining the fate of the Temelin reactors, the Lower Bohemian regional council in the Prague area voted in late 1990 to halt construction of units 3 and 4.

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Denmark

In 1985, the Danish Parliament voted that nuclear power should no longer be part of the country's energy plans, and that sites reserved for nuclear power plants should be made available for other uses. The decision referred to nuclear power with presently-known technology, thus leaving open the possibility to reconsider the nuclear option in the future. The Danish government has also been exerting pressure on Sweden to close its Barseback station, which is located only 20 km away across the Øresund. Thus far, Sweden has not taken any action in response.

Finland

In 1987, the Finnish government declared a moratorium on the ordering of the country's fifth nuclear power plant. The present government of Finland is a coalition of Social Democrats, Conservatives, and the Swedish People's Party. This moratorium will expire in March 1991 when new general elections are held. Consequently, the nuclear issue has become a key topic of debate as the elections approach.

Support for nuclear power has been growing in Finland; recent studies have recommended maintaining the option, public opinion is more positive, and even the Prime Minister has publicly encouraged nuclear power. Finland's four operating reactors have some of the highest capacity factors in the world. Two of the reactors are Finnish-modified Soviet-designs. Perusvoim Oy (PVO), the consortium trying to build the fifth nuclear plant, has officially notified the Ministry of Trade and Industry that it intends to apply for permission to build the plant following the elections. The nuclear issue is still divisive, and the outcome of the March elections will largely determine the fate of Finland's nuclear option in the near term.

Germany

Germany's nuclear program continues to struggle with local opposition throughout the country. The conservative Christian Democratic Union (CDU) leads the national government, and is a strong supporter of nuclear power. The platform of the Social Democratic Party (SDP), the principal opposition party, opposes the use of nuclear power. The anti-nuclear SDP controls five of the seven state governments in former West Germany that have nuclear power plants. This presents a special challenge to the Federal government because Germany's post-World War II constitution tends to favor states' rights over those of the central government. The pro-nuclear CDU leads the governments in Bavaria and Baden-Würtemberg; an SDP-led government runs the states of Hesse, North-Rhine Westphalia, Schleswig-Holstein, Hamburg, and Lower Saxony.

Although federal courts have ruled specifically that federal mandates concerning nuclear power override any state laws, the states continue to refuse to follow federal rulings regarding nuclear power in certain instances. For example, the state of North Rhine-Westphalia defied a federal order to license the Kalkar fast breeder reactor, by commissioning a study of emergency planning associated with the reactor. The court had ruled the state did not have the right to commission a study comparing the Kalkar reactor to a Soviet RBMK (Chernobyl-type) reactor and thus delay the licensing process. But, by commissioning the emergency planning study, the state does not have to proceed with licensing and the federal government cannot overrule, because emergency preparedness planning is the responsibility of the individual states.

The states of Schleswig-Holstein and Lower Saxony have reiterated their intention to phase out nuclear power in their states. The efforts are initially focused on closing down the nuclear power plants, with the rest of the fuel cycle as a target in latter stages. The Schleswig-Holstein state government has even declared its desire to close all three plants in its state (Brokdorf, Brunsbüttel, and Krümmel) as early as 1996.

Additionally, with reunification last October, the German government now must address the Soviet-designed East German reactors at Greifswald and Stendal. Even before unification, West German nuclear laws were adopted by East Germany. But as a result, all four plants at Greifswald were shut down because of safety concerns. The units at Stendal are under close scrutiny and will likely be shut down as well.

Despite all of this opposition and positioning by the state governments, the pro-nuclear federal government is working to convince the public of the benefits of maintaining the nuclear option for Germany.

Italy

In November 1987, Italian voters approved an anti-nuclear referendum that resulted in a five-year moratorium on new nuclear facilities, and the shutdown of two operating units, Trino and Caorso. The units were initially in a cold shutdown, but a near-unanimous vote on June 12, 1990 by the Italian Parliament instructed the government to begin permanent decommissioning of the two units.

The moratorium expires in 1992, and nuclear proponents hope to have nuclear power reconsidered as an energy source at that time. The initial moratorium legislation allows for research to improve the safety of reactor designs. The national energy plan of Italy, recently passed in parliament after two years of debate, does not specifically exclude nuclear. Italy is participating in several passively-safe reactor design programs, and proponents are already formulating plans to have designs for these reactors ready for consideration when the moratorium expires.

The Netherlands

A bipartisan government, comprised of Christian Democrats and Social Democrats, was elected in the fall of 1989. The new government made no statements regarding nuclear power other than that the coalition would not consider the issue in the next four years. Both parties' platforms call for no new construction on any new nuclear facility. Debate on the issue has become more common, and supporters are now calling to reconsider the nuclear option in light of the threat of global warming. However, The Netherlands will likely continue its present course of not considering any new nuclear power projects in the next few years, thereby postponing any commercially operating plant at least until the next century.

Poland

In September 1990, as part of a new national energy plan, the Solidarity-led government of Poland voted to cancel the four-unit Zarnowiec station and place a ten-year moratorium on nuclear power. Construction of the first two units at Zarnowiec began in 1983, but due to delays and costs, were only about 20% complete.

The primary reasons for placing the moratorium on Zarnowiec and nuclear power were concerns about the safety of the Soviet-designed reactors, and very severe capital constraints. The new energy plan only defers nuclear; the government intends to reconsider the option in the future.

Soviet Union

The Soviet Union's nuclear program faces the same challenges of reactor safety, waste disposal, and public acceptance that face western nuclear programs. The Soviet government is still firmly committed to nuclear power because it realizes the country's dire need for clean, safe energy supplies to further economic growth. However, just as with other issues in the Soviet Union, individual republics have conflicting views of nuclear power and are resisting federal government mandates.

During 1990, the Ukrainian Parliament passed a five-year moratorium, halting all plans and construction on nuclear plants in the republic. While a ruling by a republic does not pre-empt federal regulations, it can be effective because the republic provides all of the local labor and supplies necessary for construction. The four completed nuclear stations (15 units) in the Ukraine continue to operate, and provide nearly 40 percent of the Soviet Union's nuclear generating capacity.

Russia, the Soviet Union's largest republic, has most of the country's fuel cycle facilities. In 1990, it declared that it would no longer accept spent fuel or waste from outside the republic. This statement by the Russian president, Boris Yeltsin, did not indicate if the republic intended to honor existing contracts or to stop all shipments immediately. Other, more pressing economic problems are getting priority at present, so shipments to Russia are continuing.

Spain

In 1983, Spain issued a national energy plan for 1983-1992. The plan significantly reduced projected electricity demand growth, so as a result, the government imposed a nuclear moratorium to avoid the construction of excess capacity. Spain had ten reactors operating when the moratorium was officially imposed. The moratorium also halted construction of the nearly-complete Lemoniz and Valdecaballeros reactors. This year, the government is once again preparing a new 10-year energy plan. Debate has already begun on whether to continue the moratorium or suspend it. Spain's ruling Socialist Worker's Party was supposed to address the issue at its November 1990 Congress. Instead, the party continued an ambiguous policy that nuclear power should eventually be replaced by other energy sources, but no firm decision will be made immediately. Thus, debate on the new national energy plan in the upcoming year will have to address the moratorium issue, and nuclear's fate in Spain will be decided politically.

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Sweden

Sweden's energy policy drew continued criticism in 1989 and 1990. The policy was not planned but rather, developed piecemeal in the early 1980s. A moratorium that called for the complete phase-out of nuclear power by 2010 was passed in 1980. Laws that limited increases in total CO_2 emissions, and that banned any new large-scale hydroelectric development were passed separately. The reality of eliminating current capacity and preventing new capacity from being constructed led to heavily-publicized debates of the defacto energy policy. The government finally appointed a committee in late 1989 to reconcile the various opposing viewpoints.

In January 1991, three of Sweden's major political parties—Social Democrat, Liberal, and Center—announced that they had reached an agreement on a plan to phase out nuclear power in their country. The agreement will delay the start of the phase-out into the next century. The validity of the phase-out date of 2010 is now in question. The agreement also calls for an investment of nearly US$1 billion in development of renewable energy sources and conservation measures. Additionally, the new strategy will change the policy on CO_2 emissions, calling for a strategy to stabilize the level of global warming emissions by the year 2000. The agreement must still be passed by parliament.

Switzerland

On September 23, 1990 Swiss voters went to the polls to vote on the country's third anti-nuclear referendum in just over 10 years. While the previous anti-nuclear referendums failed, a portion of this referendum was approved. The Swiss rejected a proposal that called for the progressive abandonment of nuclear power, but voters approved a 10-year moratorium on licensing and construction of new nuclear plants. Voters also approved the third portion of the referendum, which authorized the government to allocate funds toward investigating alternative energy sources, and to take a more active role in regulating energy consumption.

The election results were essentially a compromise by the voters—it did not shut down existing nuclear plants, but will stop additional construction of new plants and will examine other energy alternatives. The moratorium vote essentially formalizes the defacto moratorium that has been in effect in Switzerland since the Chernobyl accident; political developments since that accident have effectively stopped any progress on new plants. The Swiss government and most industrial and utility forces urged voters to turn down the entire initiative, but voters ended up approving what was in their view, a compromise alternative.

United Kingdom

The primary development in the UK energy sector in the last few years has been the privatization of the electricity supply industry. Nuclear power was originally included in the privatization plans, but many frustrating developments led to the government decision to withdraw it from the privatization initiative. The present UK government (Conservative Party) favors the continued development of nuclear power, but as a result of the privatization efforts, a four-year moratorium on new nuclear power construction has been imposed. The opposing Labor party has indicated that it will not support new nuclear plants, but it will not block the completion of the Sizewell B PWR plant or work in the reprocessing industry. The government has indicated that it will review the moratorium again in 1994.

Yugoslavia

The Yugoslavian government approved a nuclear moratorium in June 1989 that postpones the construction of any new nuclear power plants, and postpones any investment decisions on new construction until the year 2000. The law does not prohibit mining, geological work, scientific research, and siting studies for future nuclear plants and waste disposal facilities. The idea of the ban originated in the Republic of Slovenia, which passed a local construction moratorium in 1987. Studies by a government investigative committee showed that only a small percentage of Yugoslavia's other energy resources (hard coal, hydro) had been utilized. Thus, with all of the other economic and ethnic challenges facing the country, nuclear power will be a low priority until the moratorium expires in 2000.

ASIA

Japan

Japan still has one of the most aggressive and successful nuclear energy programs in the world. The government plans for the country's utilities to produce more than 40 percent of Japan's electricity from nuclear plants (up from 30 percent) within twenty years. However, equally aggressive anti-nuclear opposition has begun to emerge and may slow the rate of expansion. Public opinion has increasingly grown against nuclear power, and the recent incident at Mihama 2, although minor in scale, has further increased opposition.

In what was effectively a vote of confidence, residents of Aomori Prefecture turned out in strong numbers in early February to re-elect their incumbent, pro-nuclear governor. Governor Kitamura won his fourth term of office running against two opponents who campaigned to freeze or scrap the Rokkasho-mura fuel cycle complex under construction in Aomori Prefecture. Within the domestic nuclear industry, Governor Kitamura's re-election was viewed as overcoming an important obstacle in Japan's pursuit of self-sufficiency in the nuclear fuel cycle.

Philippines

The Philippines are in the midst of an energy crisis, yet, primarily for political reasons, the government will not authorize the completion and operation of the nearly-finished PNPP-1 nuclear power reactor. The government has expressed some anti-nuclear sentiment, but the primary reason for not operating the plant is that the current government alleges corruption and poor workmanship during the plant's construction under the previous regime. The mothballed 620-MWe PWR would take nearly two years before it could be ready to operate.

Taiwan

Taiwan's seventh and eight nuclear reactors were in the planning stages in 1983 when the government decided to delay any further work on the units. Public opposition to the units has gained strength in the 1980s, but the government is once again beginning to examine plans to restart the program. The government's Council for Economic Planning and Development even included construction of the units in its new six-year Economic Plan that began in 1991. Demand for electricity has continued to grow in Taiwan, and approximately one-third of its electricity comes from oil— much of it from Kuwait. Thus, electricity demand and conflicts in the Persian Gulf are forcing the government to re-examine the nuclear option, despite public opposition.

NORTH AMERICA

Canada

Canada is the world's largest uranium producer and the federal government continues to support nuclear power. But, as in many other countries, opposition within individual provinces is hindering a successful national nuclear program.

Ontario

The province of Ontario is the most populous and industrialized province in Canada. The province's primary utility, Ontario Hydro, announced in early 1990 a new 25-year energy plan that called for ten new 880-MWe Candu reactors, in addition to other energy sources. But, a surprising victory in the September provincial elections by the anti-nuclear New Democratic Party (NDP) has drastically altered Ontario Hydro's plans. Shortly after taking control of the government, the NDP imposed a moratorium on any additional nuclear plants in the province, and ordered Ontario Hydro to cancel all planning and advanced engineering work on the 10-plant nuclear plan. The government's freeze does not affect Ontario Hydro's planning and construction at its Darlington station, or the hearings on its 25-year demand/supply plan.

Saskatchewan

The Saskatchewan New Democratic Party (NDP) was in power from 1971 to 1982, and provided supportive legislation that was a key factor in the development of the province's uranium industry. The party still is quite powerful in the province and has adopted a policy opposing the use and development of nuclear power. Therefore, the party opposes any proposals for new nuclear power plants in the province. The party even stated that, as an example, it would neither fund nor license the 10-MWe Slowpoke reactor proposed for the University of Saskatchewan.

Nova Scotia, Newfoundland, and British Columbia

In early 1990, Novia Scotia decided to continue its moratorium on uranium exploration for another five years, but the exploration ban for other minerals was lifted. Newfoundland passed a 10-year nuclear moratorium in 1976, and renewed it in 1986. British Columbia's ten-year nuclear moratorium expired in 1986 and was not reinstated.

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United States

The USA was one of the first countries to experience localized opposition, and the legal environment in the USA has made completing and operating a new nuclear plant a political morass. On June 6, 1989, an anti-nuclear referendum that called for the closure of the Rancho Seco nuclear plant narrowly passed. The Sacramento Municipal Utility District (SMUD) closed down the plant the following day. The referendum was unusual because it applied to an already-operating plant and was primarily based upon economics (the plant's 15-year, average capacity factor was 38 percent). The utility is considering converting the plant to a gas-fired station.

Long Island Lighting Company's (LILCO) Shoreham nuclear plant has fought strong opposition since it began. The plant was eventually completed, but never received its full-power operating license. After years of legal battles, LILCO, with the approval of its shareholders, agreed to sell the unused plant for one dollar to the Long Island Power Authority. The effective sale of the plant to the city for decommissioning, was in exchange for guaranteed rate increases over the next ten years to recover most of the construction costs.

Pro-nuclear advocates, including the federal government, are fighting the LILCO sale to prevent the new plant from being dismantled. Thus, the legal battles are not yet over for Shoreham, though it is unlikely that the plant will ever operate as a nuclear unit.

On a more positive note, after a 17-year legal struggle, the Seabrook nuclear reactor in New Hampshire received its operating license in March 1990, and reached full power in July. The plant was hampered by many issues, including major regulatory delays, massive anti-nuclear protests, the refusal of neighboring Massachusetts to cooperate in emergency evacuation planning, operating license conflicts, and the bankruptcy of the reactor's primary owner, Public Service of New Hampshire. Despite the amount of attention the public gave the Seabrook plant, once the unit began operation, the issues quickly lost importance with the public. By July, polls showed that only six percent of New Hampshire residents considered Seabrook the state's most pressing problem (down from 33 percent).

Texas Utilities Electric Company received a full-power license for its Commanche Peak 1 reactor in April 1990. The reactor also had to overcome many problems, but by 1988 the last intervenor group had reached an agreement with the utility and the Nuclear Regulatory Commission (NRC). The unprecented agreement gives the intervenor (Citizens Association for Sound Energy) a place on the managing board of the unit and access to the site and to the utility's records. The plant reached commercial operation in July.

A final positive event occurred in November 1990 when Oregon voters elected to keep Portland General Electric's (PGE) Trojan nuclear power plant open. It was the second anti-nuclear referendum in four years for Oregon voters. The referendum, if passed, would have closed the plant until a federal repository for commercial reactor waste was opened. PGE's campaign to oppose the measure focused on the demand for electricity and on the economics of the issue. PGE estimated replacement electricity costs could go as high as $3 billion over twenty years.

CONCLUSION

Nuclear power has many obstacles to overcome if it is to regain the success it experienced in the 1960s and early 1970s. While many governments have taken some anti-nuclear actions, nearly all of them are keeping the nuclear option open, and many are reconsidering their policies this year. Successes with certain reactors in the USA, and in countries like France, South Korea, and Japan, demonstrate that opposition can be overcome through education and negotiation.

NUCLEAR INDUSTRY CALENDAR

1991

March 24-27 *Fuel Cycle Conference '91* (Sheraton Scottsdale Hotel, Phoenix, Arizona).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 8-10 ***Japan Atomic Industrial Forum Annual Conference*** (Tokyo, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 14-17 ***INFO '91 Conference*** (The Westin Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 14-18 ***Third International Conference on Nuclear Fuel Reprocessing & Waste Management*** (Sendai, Japan).
Sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, and co-sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 21-24 ***International Topical Meeting on LWR Fuel Performance*** (Palais des Papes, Avignon, France).
Sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Fragema, BP3021, F69398 Lyon Cedex 03, France; Tel: (33) 74 72 8159; Fax: (33) 74 72 8760.

April 22-25 – ***JAIF International Conference on Water Chemistry in Nuclear Power Plants*** (Fukui, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

May 2-3 ***Utility Nuclear Fuel Economics Group Meeting*** (Downtown Holiday Inn, Minneapolis, Minnesota).
Sponsored by Northern States Power.
Contact: David Austin; 612-330-7571.

May 8-10 ***Second International Conference on Transportation for the Nuclear Industry*** (Bournemouth, United Kingdom).
Co-Sponsored by the Institution of Nuclear Engineers, the European Nuclear Society, the American Nuclear Society, the Chartered Institute of Transport, and the Institution of Civil Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

May 12-14 ***World Nuclear Fuel Market Annual Meeting*** (Atlanta, Georgia).
Contact: Donna Cason, World Nuclear Fuel Market; 404-447-1144.

May 14-16 ***Annual Meeting on Nuclear Technology '91*** (Hotel & Congress Center Maritim, Bonn, Germany).
Sponsored by the Kerntechnische Gesellschaft e.V. and the Deutsches Atomforum e.V.
Contact: INFORUM GmbH, Congress Office JK'91, Heussallee 10, D-5300 Bonn 1, or 0228/507 223.

June 2-6 ***American Nuclear Society Annual Meeting*** (Marriot Orlando World Center, Orlando, Florida).
Contact: ANS Meetings Department; 708-352-6611.

June 23-26 ***International Conference on Enrichment*** (The Westin Hotel, Washington, DC).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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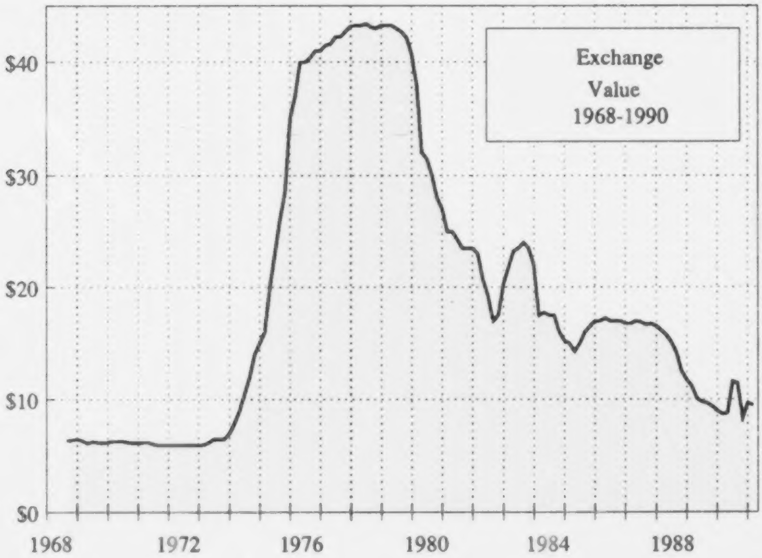
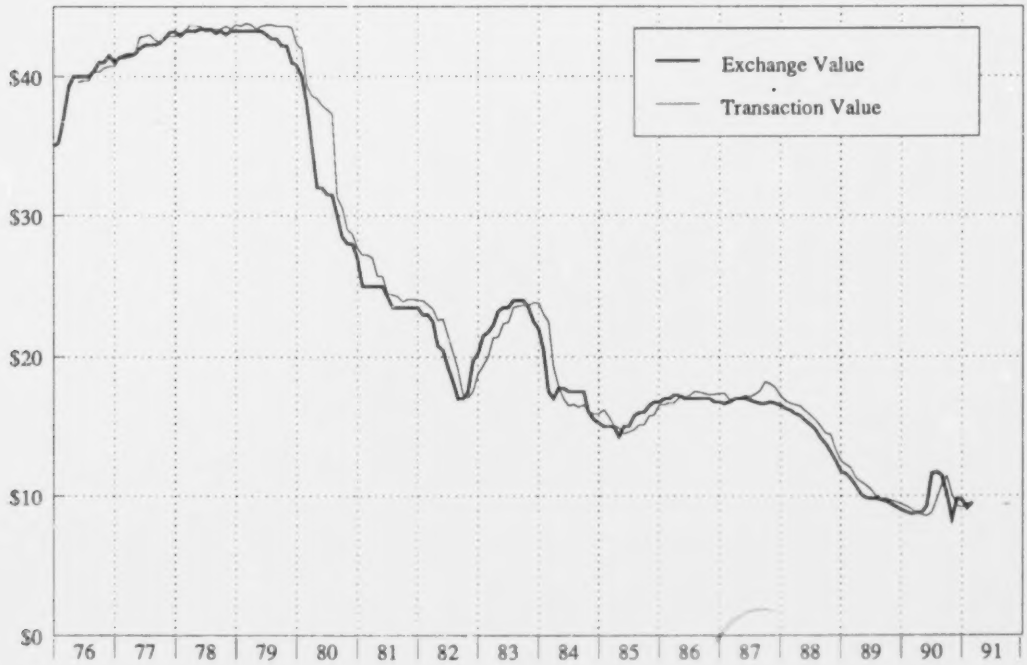
NUEXCO Historical Exchange Value and Transaction Value
(in US dollars per Pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U3O8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	**9.50**										

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U3O8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF6 Values

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	**27.75**										

US Premium (Relative to the UF6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	**1.45**										

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U3O8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	**9.45**										

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	**50**										

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Loan Rates

	Determined as of the last day of the month indicated (Percent per Annum)											
Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	**3.50**										

* Float with Prime Rate

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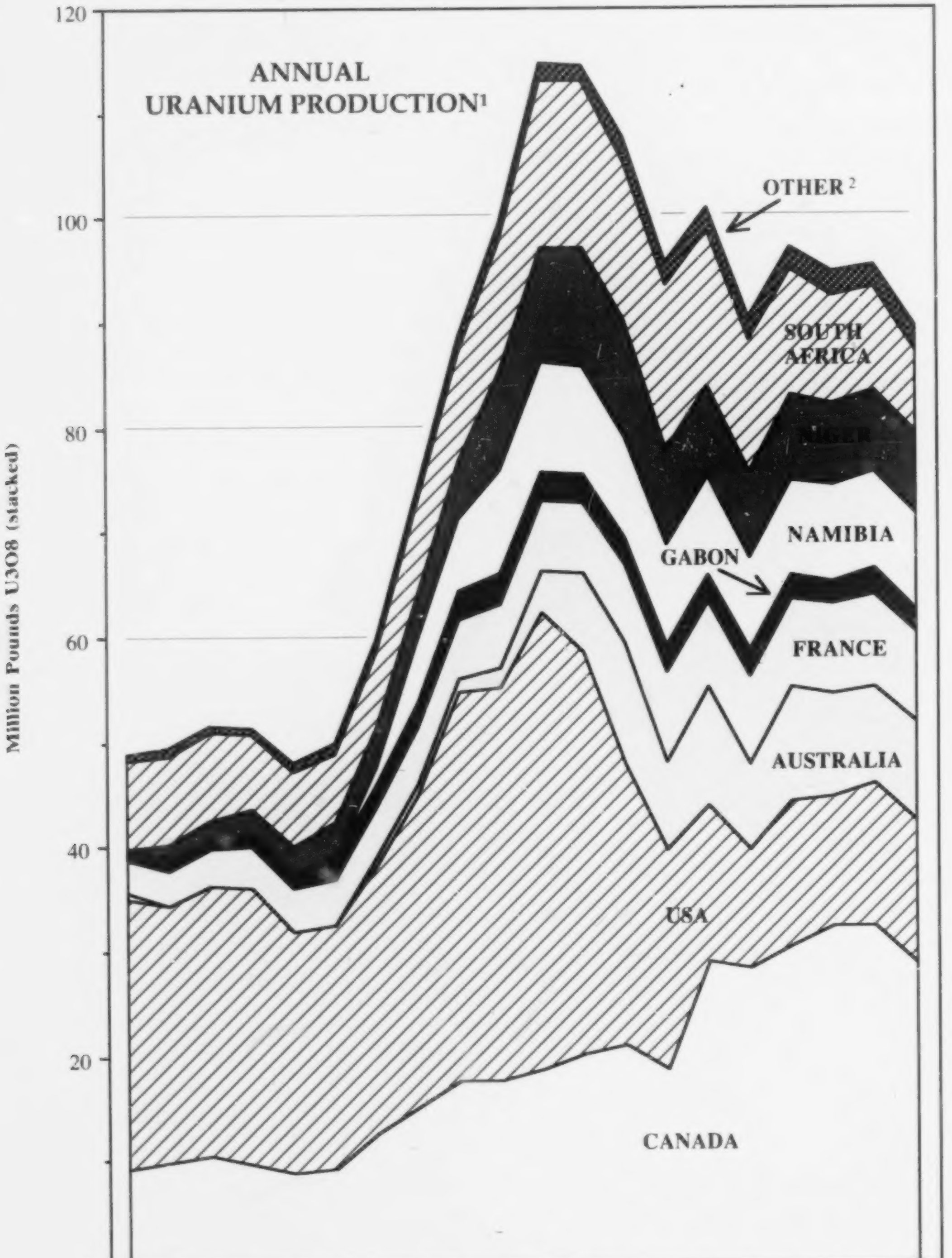

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others [2]—2.3).

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, (West) Germany, and Yugoslavia

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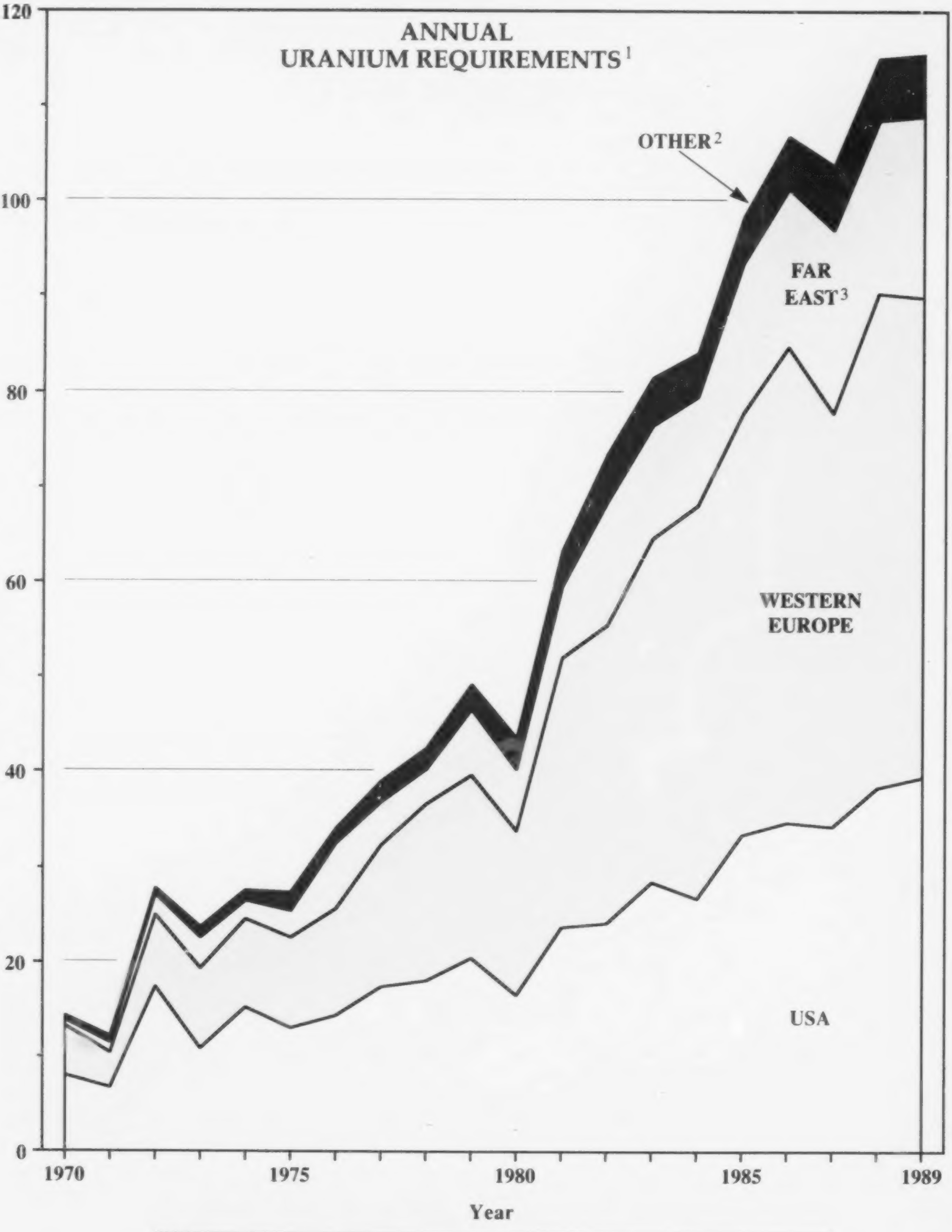
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
Jan	1990	—	119.2	—	128.1
Feb	1990	—	120.8	555.80	128.2 **R**
Mar	1990	204.1	121.5	—	128.4 **R**
Apr	1990	—	119.9	—	128.6 **R**
May	1990	—	118.9	566.60	128.8
June	1990	207.4	116.6	—	129.2
July	1990	—	116.4	—	129.3 **R**
Aug	1990	—	122.4	574.10	129.4
Sept	1990	208.9	128.2	—	129.8 **R**
Oct	1990	—	134.1	—	129.9
Nov	1990	214.5	133.7	—	129.8
Dec	1990	—	—	—	129.9

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	–.–	–.–	–.–	–.–	–.–
1981	Avg.	83.4	75.5	–.–	–.–	–.–	–.–	–.–
1982	Avg.	89.0	83.7	–.–	–.–	–.–	–.–	–.–
1983	Avg.	92.1	88.5	17.22	–.–	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	–.–	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	–.–	–.–	–.–	–.–	–.–
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.2	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.5 **R**	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.7	121.9	23.38 **R**	21.83 **R**	19.48 **R**	14.93 **R**	15.73
Dec	1990	110.7 **R**	121.8	23.29 **P**	21.66 **P**	19.74 **P**	14.70 **P**	16.07 **P**
Jan	1991	110.7 **R**	125.0	–.–	–.–	–.–	–.–	–.–

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	—	—
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317 **R**	922,454 **R**
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	—	—
Dec	1990	133.02	312.37	217.1	214.7	—	—
Jan	1991	—	—	219.5	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]				Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.11 **P**	14.36 **P**	13.54 **R**	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.7	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4 **R**	118.4 **R**	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.3	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.6	120.1	133.8	—	14.34 **R**	14.73 **R**	13.73	10.53 **R**
Dec	1990	118.9	118.6	133.8	133.1	14.38 **P**	14.67 **P**	13.75 **R**	10.57 **R**
Jan	1991	118.3	118.9	134.6	—	-.-	-.-	13.82 **P**	10.65 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] ($/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1989: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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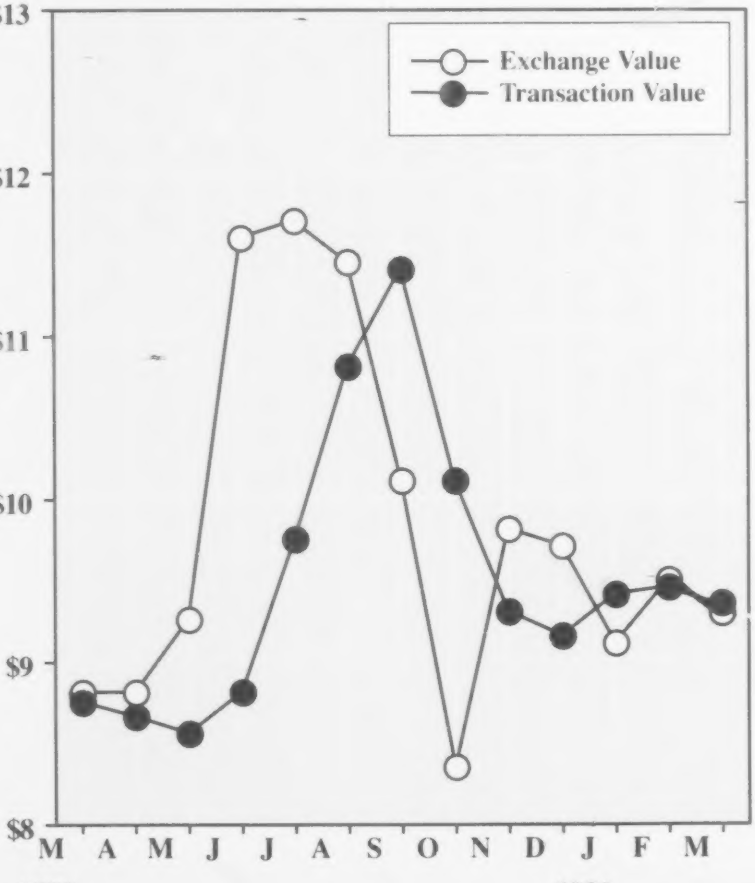

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Focus

- **Rössing Uranium Limited** 22

Rössing Uranium Limited is Namibia's largest employer, and the Rössing mine is the second largest uranium mine in the world. Yet Rössing is one of the lowest grade uranium deposits ever commercially exploited, with an average grade of only 0.035 $^{w}/_{o}$ U_3O_8. To efficiently develop such a low-grade deposit, RUL uses extensive real-time cost analysis systems and has the highest rock production rate of any uranium mine in the world.

- **Conversion and Enrichment in the Soviet Union** 27

This article is based on information provided by Mr. Boris V. Nikipelov, First Deputy Minister of Atomic Energy and Industry, and his colleague, Mr. Anatoly A. Vlasov, during a recent visit to the Soviet Union by Contributing Editor R. Wesley Miller. Although some details remain classified, the article contains much previously unavailable information, such as a conversion process flow chart and photographs of a gas centrifuge enrichment facility.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report March 31, 1991	Last Report February 28, 1991	12 Months Ago March 31, 1990
EXCHANGE VALUE[1]	**\$9.30**/lb equivalent U_3O_8	\$9.50	\$8.80
UF_6 VALUE[2]	**\$27.50**/kg U as UF_6	\$27.75	\$24.40
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.45**/lb U as UF_6	\$1.45	\$1.45
SWU VALUE[5] **(0.3 w/o tails assay)**	**\$52/SWU**	\$50	\$50
TRANSACTION VALUE[6]	**\$9.35**/lb equivalent U_3O_8	\$9.45	\$8.75
Transactions	**19**	18	13
Months	**3**	3	3
Millions of Pounds	**3.0**	2.6	4.4

DEFINITIONS

1 The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

2 The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

3 The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

4 The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

5 The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

6 The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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MARCH MARKET REVIEW

(as of March 31, 1991)

OVERVIEW

The uranium market softened somewhat during March; both the Exchange Value and UF_6 Value declined slightly. The Exchange Value fell to $9.30 per pound U_3O_8 and the UF_6 Value declined to $27.50 per kgU as UF_6. Seven near-term natural uranium sales are reported, totalling nearly one million pounds equivalent U_3O_8. In addition, over 1.2 million pounds equivalent U_3O_8 changed hands in four enriched uranium product (EUP) sales.

Total year-to-date market volume (**Table 1**) equals only 5.0 million pounds equivalent U_3O_8; this is over six million pounds less than 1990's record first quarter volume. More cautious buyers and sellers, higher prices, and more discretionary demand thus far this year account for the difference. Moreover, market volume has traditionally been greatest during the second quarter, exceeding 21 million pounds last year. In comparison, total volume for the entire year of 1988 failed to reach 15 million pounds.

The Loan Rate and Conversion Value remained unchanged at 3.5 percent per annum, and $1.45 per pound U as UF_6, respectively. No conversion sales are reported, but two natural uranium loans were initiated totalling over 1.1 million pounds equivalent U_3O_8.

The SWU Value climbed two dollars, to $52 per SWU. Six enrichment sales, including the four EUP transactions mentioned above, are reported for the month, totalling almost 400 thousand SWU.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	March 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	3	0.5	14	2.2
Natural UF_6	4	0.4	6	0.9
EUP	4	1.2	7	1.9
Total[2]	**11**	**2.2**	**27**	**5.0**

[1] million pounds equivalent U_3O_8

[2] columns may not total due to independent rounding

NATURAL URANIUM AND CONVERSION

The **Exchange Value** declined to **$9.30** per pound U_3O_8 on March 31, a two-percent drop. A lack of firm demand, coupled with the presence of motivated sellers, characterized the market at month end. Demand was largely discretionary; buyers have been reluctant to commit to new near-term purchases anticipating a weaker spot market later in the year. Only three near-term concentrates sales are reported for a total exceeding 500 thousand pounds equivalent U_3O_8. A utility, an intermediary, and a producer made up the three buyers. The sales were all concluded at prices near the March 31 Exchange Value.

* * *

The softening in the uranium market was also reflected by the decline in the **UF_6 Value**, which fell $0.25, to **$27.50** per kgU as UF_6. Four natural UF_6 sales, totalling nearly 450 thousand pounds equivalent U_3O_8, are reported. All occurred at prices near the March 31 UF_6 Value and call for delivery during second quarter 1991. Two utilities and two European intermediaries purchased the UF_6 from US intermediaries.

For only the second time in the history of the UF_6 Value, UF_6 is selling at a level exactly equal to the sum of the values of its components (**Figure 1**), indicating that buyers are apparently indifferent to the form of uranium purchased. The only other time this occurred was in May 1985, the second month the UF_6 Value was ever published.

* * *

In the long-term uranium market, four transactions are reported. Three intermediaries and one producer sold six million pounds equivalent U_3O_8 for delivery during the period 1991-1998. Six other utilities continued to evaluate long-term offers at month end.

* * *

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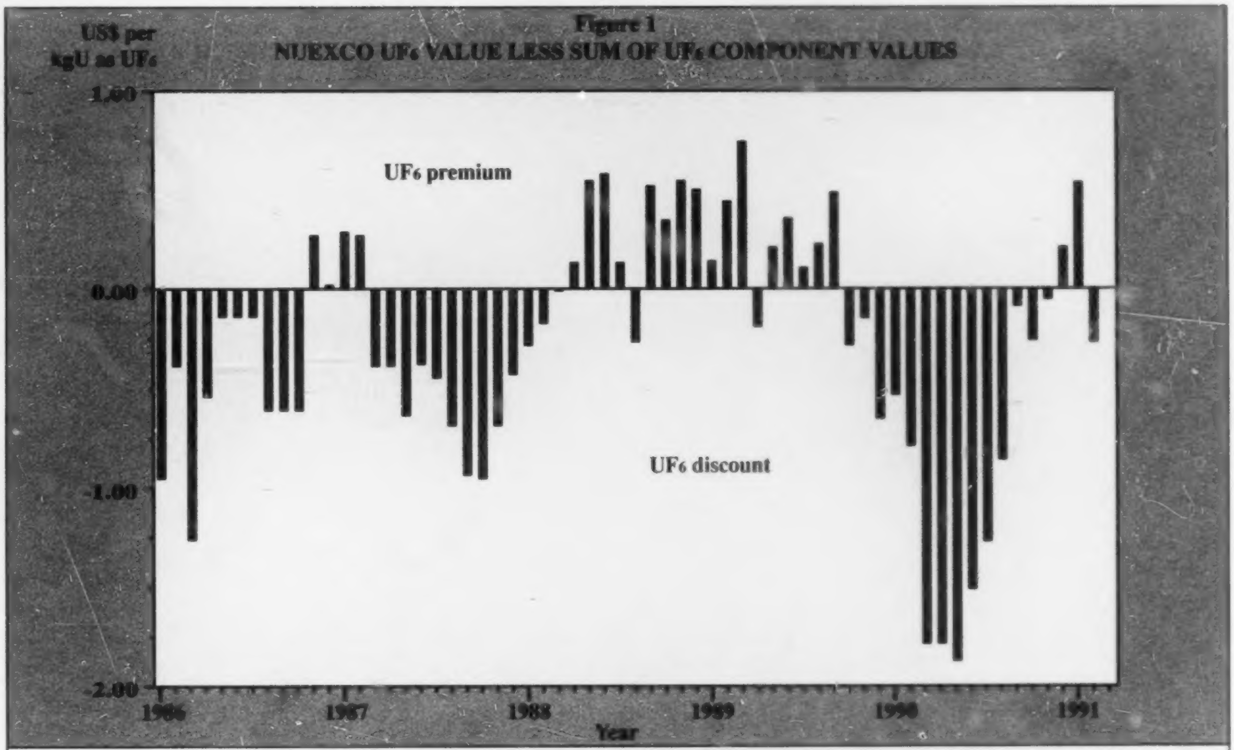

Figure 1
NUEXCO UF6 VALUE LESS SUM OF UF6 COMPONENT VALUES

[1] UF6 Value – [(EV x 2.61285) + (CV x 2.20462)]. If this expression exceeds zero, that represents a UF6 premium relative to the sum of its components. If the expression is less than zero, it represents a discount.

The **Transaction Value** dropped $0.10, to **$9.35** per pound U_3O_8 based on 19 transactions over 3 months involving 3.0 million pounds equivalent U_3O_8. The difference between the Transaction Value and the Exchange Value remained at $0.05 for a second month, as the Exchange Value has been relatively stable for the past five months (within a $0.70 range). Consequently, the Transaction Value has settled near the same level.

* * *

Active uranium supply decreased slightly in March, slipping from 5.4 million pounds, to **5.3** million pounds equivalent U_3O_8. Conversely, **active uranium demand** increased, jumping from 2.5 million pounds, to **3.9** million pounds equivalent U_3O_8. As a result, the **supply-demand ratio** fell to **1.4**.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply [1]	Active Demand [1]
• Uranium (thousand lbs equivalent U_3O_8)	5,300	3,875
• Supply/Demand Ratio:	1.4	
• Loan (thousand lbs equivalent U_3O_8)	8,500	0
• Conversion (thousand lbs U as UF_6)	755	350
• SWU (thousand SWUs)	575	280

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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The **Loan Rate** remained unchanged at **3.5** percent per annum. Two loans are reported totalling over 1.1 million pounds equivalent U_3O_8. Intermediaries borrowed from utilities in both transactions. Loan supply declined by over 800 thousand pounds, but still exceeds 8.5 million pounds equivalent U_3O_8 (**Table 2**).

* * *

The **Conversion Value** also is unchanged, remaining at **$1.45** per pound U as UF_6 for the 13th consecutive month. No conversion transactions are reported from March.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** increased two dollars, to **$52** per SWU. SWU sales late in the month occurred near or slightly above the March 31, 1991 SWU Value. In EUP sales earlier in the month, the SWU component could be evaluated at levels nearer the February 28 SWU Value. The market's current tendency to sell EUP at a discount to the sum of the values of the contained SWU and feed components makes price evaluation of the individual components subject to wide interpretation.

Six SWU sales are reported from March totalling almost 400 thousand SWU. Of these sales, four involved SWU contained in EUP for a total of almost 300 thousand SWU and 1.2 million pounds equivalent U_3O_8.

Table 3
ENRICHMENT PRICES
(March 31, 1991)

Prices	This Month Report 272	Last Month Report 271	12 Months Ago Report 260
NUEXCO SWU Value ($US per SWU)	52	50	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF_6[6]: ($US per KgU as UF_6)			
2.0 w/o U_{235}	202	201	193
2.5 w/o U_{235}	279	277	267
3.0 w/o U_{235}	359	355	343
3.5 w/o U_{235}	440	435	421
4.0 w/o U_{235}	522	516	500
4.5 w/o U_{235}	605	598	579

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5058	1991	Less Than 50	98-102	Utility	Intermediary	UF_6
5059	1991	50-100	90-97	Utility	Intermediary	
5060	1991	Less Than 50	98-102	Intermediary	Intermediary	UF_6
5062	1991	101-300	98-102	Utility	Intermediary	UF_6
5065	1994-1998	301-600	See Remarks	Utility	Intermediary	UF_6, Base Price Escalated
5067	1991	301-600	98-102	Producer	Intermediary	
5068	1991-1995	1,000-3,000	See Remarks	Producer	Producer	Base Price Escalated
5071	1991	101-300	98-102	Intermediary	Intermediary	UF_6
5072A	1991	Less Than 50	See Remarks	Fabricator	Intermediary	Contained In EUP
5073A	1991	50-100	See Remarks	Utility	R	Contained In EUP
5074A	1991	301-600	See Remarks	Intermediary	Fabricator	Contained In EUP
5076	1992-1996	1,000-3,000	See Remarks	Utility	Intermediary	Base Price Escalated
5077A	1991	601-1,000	See Remarks	Utility	Intermediary	Contained In EUP
5078	1991	50-100	98-102	Intermediary	Utility	
5079	1992-1996	1,000-3,000	See Remarks	Utility	Intermediary	Base Price Escalated

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5069	1991	601-1,000	Above 110	Intermediary	Utility	
5070	1991	301-600	98-102	Intermediary	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks

No Conversion Sales are reported

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5072B	1991	Less Than 50	See Remarks	Fabricator	Intermediary	Contained in EUP
5073B	1991	Less Than 50	See Remarks	Utility	**R**	Contained in EUP
5074B	1991	50-100	See Remarks	Intermediary	Fabricator	Contained in EUP
5075	1991	50-100	98-102	Utility	Producer	
5077B	1991	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5081	1991	Less Than 50	98-102	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A	700	1,045 per year	1991-1993	UF_{6e}
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1501	3,000	1,000 per year	1991-1995	U_3O_8/UF_6
91-1060	100	—	1991	
91-1502*	500	—	1991	
Total	**5,300**			
INACTIVE	**4,100**			
AVAILABLE FOR LOAN:				
ACTIVE				
90-1016	1,000	—	—	U_3O_8
90-1230	1,000	—	—	U_3O_8
90-1260	1,000	—	—	UF_6
90-1275	100	—	—	U_3O_8
91-1018	500	—	—	U_3O_8
91-1034	1,000	—	—	U_3O_8
91-1084*	3,900	—	—	U_3O_8
Total	**8,500**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 88-1182, 90-1056, 91-1009, 91-1249

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100A	45	—	1991	UF_6e
90-1289	210	—	1991	
91-1010A*	85	—	1991	UF_6e
91-1040*	1,960	—	1991-1992	UF_6
91-1045	120	—	1991	
91-1067*	350	—	1991	
91-1071A*	325	—	1991	UF_6e
91-1073*	100	—	1991	U_3O_8/UF_6
91-1075*	600	—	1991	
91-1080A*	80	—	1991	UF_6e
90-1291	—	100 per year	1991-1995	
91-1014A	—	6,800	1992-2001	UF_6e
91-1017	—	300 per year	1995-2000	
91-1038	—	130 per year	1992-1996	
91-1054	—	1,200	1992-1997	
91-1064*	—	165 per year	1993-1997	U_3O_8/UF_6
91-1074*	—	200 per year	1993-1998	U_3O_8/UF_6
Total	**3,875**			
INACTIVE	**2,590**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1003A, 91-1029A, 91-1037, 91-1048, 91-1061

SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1077*	55	—	1991	
91-1500	300	—	1991	
91-1501	400	—	1991	
Total	**755**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1085*	350	2,950	1993-1998	
Total	**350**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1003C, 91-1033

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MARKET REVIEW

SUPPLY AND DEMAND

SWU Supply And Demand

	Quantity (Thousand SWUs)			
NUEXCO Project Number	Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
88-1006	150	—	1991	
90-1078B	200	435 per year	1991-1993	UF_6e
91-1008	75	—	1991	
91-1032	150	—	1991	
90-1500	—	1,000	1991 on	
Total	**575**			
INACTIVE	**500**			
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100B	15	—	1991	UF_6e
90-1224*	40	1,920	1991-2001	
91-1010B*	20	—	1991	UF_6e
91-1023	60	120	1991-1995	
91-1069*	30	—	1991	
91-1071B*	95	—	1991	UF_6e
91-1080B*	20	—	1991	UF_6e
90-1094	—	500	1992-2000	
90-1181	—	1,500	1996-2001	
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	UF_6e
91-1014B	—	1,770	1992-2001	UF_6e
91-1027	—	55 per year	1996-2000	
91-1028	—	125	1995-1996	
91-1055*	—	180	1992	UF_6e
91-1063*	—	15 per year	1995-1998	
91-1066*	—	320	1995-2000	
91-1083*	—	150 per year	1996-1998	
Total	**280**			
INACTIVE	**150**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1003B, 91-1029B, 91-1057

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U3O8 as Concentrates This Month (Mar. 31, 1991)	 Last Month (Feb. 28, 1991)	 12 Months Ago (Mar. 31, 1990)	per kg U as Concentrates This Month (Mar. 31, 1991)	 Last Month (Feb. 28, 1991)	 12 Months Ago (Mar. 31, 1990)
Australia (dollar)	12.00	12.10	11.70	31.20	31.46	30.41
Belgium (franc)	326.43	297.62	309.10	848.65	773.74	803.58
Canada (dollar)	10.77	10.94	10.31	28.01	28.44	26.81
EC (ecu)	7.75	7.06	7.32	20.15	18.36	19.04
Finland (markka)	37.48	34.84	35.29	97.45	90.58	91.74
France (franc)	53.68	49.18	50.25	139.56	127.86	130.63
Germany (mark)	15.86	14.46	14.93	41.24	37.60	38.82
Italy (lira)	11,805	10,802	11,011	30,690	28,082	28,626
Japan (yen)	1,314	1,254	1,377	3,415	3,261	3,579
Netherlands (guilder)	17.88	16.30	16.82	46.48	42.37	43.72
So. Africa (comm. rand)	25.40	24.39	23.33	66.04	63.41	60.65
So. Korea (won)	6,749	6,812	6,086	17,547	17,708	15,822
Spain (peseta)	983.09	900.13	956.11	2,556	2,340	2,486
Sweden (krona)	57.27	53.64	53.95	148.88	139.46	140.27
Switzerland (franc)	13.52	12.50	13.17	35.15	32.50	34.23
Taiwan (dollar)	250.36	253.65	232.32	650.87	659.44	603.99
UK (pound)	5.34	4.95	5.38	13.89	12.88	13.99
US (dollar)	9.30	9.50	8.80	24.18	24.70	22.88

Transaction Value[1]

Country (currency)	per lb equivalent U3O8 as Concentrates This Month (Mar. 31, 1991)	 Last Month (Feb. 28, 1991)	 12 Months Ago (Mar. 31, 1990)	per kg U as Concentrates This Month (Mar. 31, 1991)	 Last Month (Feb. 28, 1991)	 12 Months Ago (Mar. 31, 1990)
Australia (dollar)	12.06	12.04	11.63	31.37	31.30	30.24
Belgium (franc)	328.19	296.05	307.34	853.21	769.67	799.02
Canada (dollar)	10.83	10.88	10.26	28.16	28.29	26.66
EC (ecu)	7.79	7.02	7.28	20.25	18.26	18.93
Finland (markka)	37.68	34.66	35.09	97.97	90.10	91.22
France (franc)	53.97	48.92	49.96	140.31	127.19	129.89
Germany (mark)	15.95	14.39	14.85	41.46	37.40	38.60
Italy (lira)	11,868	10,745	10,948	30,855	27,934	28,464
Japan (yen)	1,321	1,248	1,369	3,433	3,244	3,559
Netherlands (guilder)	17.97	16.21	16.72	46.73	42.15	43.47
So. Africa (comm. rand)	25.54	24.26	23.20	66.40	63.08	60.31
So. Korea (won)	6,786	6,776	6,051	17,641	17,615	15,732
Spain (peseta)	988.37	895.40	950.67	2,570	2,328	2,472
Sweden (krona)	57.57	53.36	53.65	149.68	138.72	139.47
Switzerland (franc)	13.59	12.44	13.09	35.34	32.33	34.03
Taiwan (dollar)	251.70	252.32	231.00	654.37	655.97	600.56
UK (pound)	5.37	4.93	5.35	13.97	12.81	13.91
US (dollar)	9.35	9.45	8.75	24.31	24.57	22.75

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[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6			per kg U as UF_6		
	This Month (Mar. 31, 1991)	**Last Month (Feb. 28, 1991)**	**12 Months Ago (Mar. 31, 1990)**	**This Month (Mar. 31, 1991)**	**Last Month (Feb. 28, 1991)**	**12 Months Ago (Mar. 31, 1990)**
Australia (dollar)	1.87	1.85	1.93	4.12	4.07	4.25
Belgium (franc)	50.90	45.43	50.93	112.20	100.15	112.28
Canada (dollar)	1.68	1.67	1.70	3.70	3.68	3.75
EC (ecu)	1.21	1.08	1.21	2.66	2.38	2.66
Finland (markka)	5.84	5.32	5.81	12.88	11.72	12.82
France (franc)	8.37	7.51	8.28	18.45	16.55	18.25
Germany (mark)	2.47	2.21	2.46	5.45	4.87	5.42
Italy (lira)	1,841	1,649	1,814	4,058	3,635	4,000
Japan (yen)	204.80	191.47	226.85	451.51	422.12	500.11
Netherlands (guilder)	2.79	2.49	2.77	6.15	5.48	6.11
So. Africa (comm. rand)	3.96	3.72	3.84	8.73	8.21	8.47
So. Korea (won)	1,052	1,040	1,003	2,320	2,292	2,211
Spain (peseta)	153.28	137.39	157.54	337.92	302.89	347.32
Sweden (krona)	8.93	8.19	8.89	19.68	18.05	19.60
Switzerland (franc)	2.11	1.91	2.17	4.65	4.21	4.78
Taiwan (dollar)	39.03	38.72	38.28	86.06	85.35	84.39
UK (pound)	0.83	0.76	0.89	1.84	1.67	1.95
US (dollar)	1.45	1.45	1.45	3.20	3.20	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
	This Month (Mar. 31, 1991)	**Last Month (Feb. 28, 1991)**	**12 Months Ago (Mar. 31, 1990)**	**This Month (Mar. 31, 1991)**	**Last Month (Feb. 28, 1991)**	**12 Months Ago (Mar. 31, 1990)**
Australia (dollar)	67.10	63.69	66.47	35.48	35.35	32.44
Belgium (franc)	1,825	1,566	1,756	965.25	869.36	857.04
Canada (dollar)	60.24	57.58	58.60	31.86	31.96	28.60
EC (ecu)	43.33	37.16	41.61	22.91	20.62	20.31
Finland (markka)	209.58	183.37	200.50	110.84	101.77	97.84
France (franc)	300.16	258.85	285.50	158.74	143.66	139.33
Germany (mark)	88.69	76.12	84.83	46.90	42.24	41.40
Italy (lira)	66,007	56,850	62,563	34,907	31,552	30,531
Japan (yen)	7,345	6,602	7,822	3,884	3,664	3,817
Netherlands (guilder)	99.96	85.78	95.55	52.86	47.61	46.63
So. Africa (comm. rand)	142.04	128.37	132.56	75.12	71.25	64.69
So. Korea (won)	37,739	35,850	34,578	19,958	19,897	16,874
Spain (peseta)	5,497	4,738	5,432	2,907	2,629	2,651
Sweden (krona)	320.20	282.33	306.56	169.33	156.69	149.60
Switzerland (franc)	75.60	65.80	74.81	39.98	36.52	36.51
Taiwan (dollar)	1,400	1,335	1,320	740.30	740.93	644.17
UK (pound)	29.88	26.07	30.57	15.80	14.47	14.92
US (dollar)	52.00	50.00	50.00	27.50	27.75	24.40

[1] Calculated using currency exchange rates published in *The Wall Street Journal* on the last working day of the month.

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RECENT DEVELOPMENTS

Australia

In an unexpected move, Mr. John Kerin, Australia's Federal Minister for Primary Industries and Energy, came out strongly for the abolition of the country's three-mine policy. Mr. Kerin's new position was outlined in a submittal to the Australian Labor Party's (ALP) Uranium Review Committee, which is charged with making policy recommendations at the ALP's June 1991 national conference. Uranium mining has been a singularly divisive issue within the ALP for more than 15 years, and Mr. Kerin, together with Prime Minister Bob Hawke and a number of their predecessors, have historically gone to some lengths to avoid confrontation with the environmental lobby and the ALP's left wing.

Mr. Kerin's letter describes the three-mine policy as illogical, hampering development, and doing nothing to meet public concerns about the environment, health and safety, nonproliferation, and Aboriginal welfare. The government is pushing for the adoption of what can be described as a pragmatic market view. By taking this position, the government is indicating that, while recognizing current market difficulties, it wants to avoid freezing Australia out of the market opportunities that it anticipates will develop in the mid to late 1990s.

It was also reported in March that Cogema was close to concluding a deal in which it would acquire a substantial share of Queensland Mines Limited's (QML) remaining uranium assets. In 1990, Nukem acquired QML's three long-term contracts and its uranium stockpile of over 6.5 million pounds U_3O_8. The assets in which Cogema would acquire an interest include: the Nabarlek 2 deposit; the Nabarlek mill; and QML's highly-prospective Arnhemland exploration leases. QML is expected to retain an interest in these assets, contrary to its previously-stated intention to sell all its mineral assets.

This deal reflects Cogema's on-going policy of seeking significant equity participation in existing or potential uranium production facilities in geographically diverse areas. Cogema already controls 1.25 percent of Energy Resources of Australia (ERA) directly, and another 2.5 percent indirectly through its 75-percent ownership of Interuran. In addition, Cogema holds a 15-percent share of Pancontinental Mining, which is now negotiating with ERA over the possible development of Pancontinental's rich Jabiluka uranium deposit, within a commercial framework that would be beneficial to all parties.

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USA

Yucca Mountain Waste Repository

DOE made several small steps toward gaining access to the Yucca Mountain site in order to begin site characterization for the USA's first nuclear spent fuel repository. The Supreme Court let stand on March 4, a Ninth Circuit Court ruling requiring the state of Nevada to review permit applications for environmental assessment of the site. Nevada said it will begin processing the first three (of 18 required) environmental permits for dust, ground water, and underground injection control for water studies. Normal processing of these permits takes three to nine months, but according to DOE's waste program Director John Bartlett, Nevada could extend the process from two to eight years if they want to stall further. As part of the National Energy Strategy (NES), the administration took the first step to remove the state's authority to review these permits. A section of the NES will amend the Nuclear Waste Policy Act of 1982 to make it possible for DOE to conduct site characterization studies without permits from a state government. Nevada's politicians are very vocal in their opposition to DOE and Congress' attempt to override the State's rights. At a Senate Energy and Natural Resources Committee hearing on the waste program March 21, DOE Secretary James Watkins and Committee Chairman J. Bennett Johnston asked Nevada Governor Bob Miller to cooperate with the federal government's efforts to characterize the site. Watkins testified that Nevada's "scorched-earth battle plan" will leave Congress with no other alternative than to pass a bill resolving the impasse at Yucca Mountain. Governor Miller testified that although the state's litigation has contributed to delays in the program, the primary reason for the lack of progress is the lack of a qualified quality assurance program, and incomplete information required for environmental permits for the on-site study. Gov. Miller and the other state officials' testimony indicated they will continue to oppose siting the repository until they are confident DOE's program will protect the health and safety of Nevada residents. Congress has signalled its intent to solve the matter legislatively. Utility witness, Allen J. Keesler, Jr., President and CEO of Florida Power Corporation, testified in support of Congressional efforts, saying "continuing to demonstrate real progress toward developing a repository is critical to restoring public confidence in nuclear energy."

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USCEA

Fuel Cycle '91 Conference

The US Council for Energy Awareness (USCEA) Fuel Cycle '91 Conference in Scottsdale, Arizona, held March 24-28, provided the forum for discussing the nuclear option as part of the National Energy Strategy as well as examining anticipated changes that will affect the nuclear industry in the 1990s. In particular, a panel discussed the globalization of the nuclear fuel market and the effect this market has on fuel manager purchasing decisions. During the conference, Harold B. Finger presented his final paper as President and CEO of the USCEA. After a little over eight years, Mr. Finger will be retiring from USCEA on May 1. His successor will be Mr. J. Phillip Bayne, President and CEO of the New York Power Authority. The following are summaries of some selected papers presented at the conference.

Nuclear Energy's Role in the National Energy Strategy

DOE's Assistant Secretary for Nuclear Energy, William H. Young, spoke briefly on the extensive process involved in preparing the National Energy Strategy (NES) and how nuclear power can contribute to meeting the nation's growing demand for electricity. The increase in demand will result in a need for 200 GWe of additional generating capacity from all types of power plants. Nuclear power can meet some of this demand, and DOE will be working in several areas to support these efforts. By 1993, DOE will submit a plan to extend the life of current nuclear power plants from 40 to 60 years, and is expected to have completed development of the advanced liquid metal reactor by 1995. Mr. Young stressed the importance of standardization of reactor design and licensing reform in the NES, and asserted the need to move DOE's uranium enrichment program to the private sector.

A Public Service Commissioner's Perspective on the National Energy Strategy

Commissioner Michael M. Wilson of the Florida Public Service Commission stated that Florida will need 15 GWe of additional electric generating capacity by 2010 after conservation is taken into account. The mix of technology used to meet this demand must be a balanced portfolio providing a diverse set of generation alternatives given environmental and economic concerns. He felt that the National Energy Strategy falls short in energy efficiency and conservation, and that there should be greater encouragement for states to be more involved in local energy strategy. Mr. Wilson believes at this time that nuclear power is not a viable option for electrical generating needs. Legislative action is necessary to address economic and regulatory concerns, the waste disposal issue, elimination of the uranium enrichment debt, and licensing reform. When questioned on what position a PUC should take on the purchase of domestic uranium as opposed to foreign origin uranium, Mr. Wilson stressed the importance of having a mix of sources, and that a balanced mix would minimize risk.

The Strategic Plan for Building New Nuclear Power Plants

Uncertainty remains a prime characteristic of the electric utility business according to Harold B. Finger, President and CEO of the USCEA. A strategic plan developed by the Nuclear Power Oversight Committee, addresses the issues confronting the nuclear industry, assigns responsibility, and sets timetables and milestones to create the conditions under which utilities can place a new nuclear plant order by the mid-1990s. Some issues, such as improving the performance of operating plants, are within the industry's direct control. Other issues, such as securing approval and acceptance for sites, require actions at the state and federal level. Mr. Finger believes that overcoming the difficulties of implementing this plan will not be easy, but the payoff to industry and the country is too great even to consider the possibility of failure.

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Energy Outlook for Europe

Mr. Stig Sandklef of Vattenfall Fuel (Sweden), characterized European energy consumption as relying on relatively high levels of fuel imports, especially natural gas, uranium, and coal. Nuclear power development will play a limited role in Europe for the next 20 years, due to institutional factors, public opinion, capital requirements, and long lead times. The Soviet Union is the largest energy producer in the world and has enormous reserves of fuel, which provides a strong incentive for Europe to promote stability in the Soviet Union and perhaps create a long-term trade relationship. A large stockpile of Soviet natural uranium and excess enrichment capacity will play an important role in keeping present spot market prices low, even if the material is not sold.

Uranium Supply and Demand Trends

Jeffrey Combs of Science Applications International Corporation, contends that low spot prices are not just the result of the massive supplies available. He believes a reduction in demand due to changes in utility inventory policies and the special selling circumstances of suppliers have also affected prices. Spot demand appears poised to increase significantly, but its extent will be a function of future spot price levels. Since the transition of the Soviet Union into a market economy will be slow, uranium will remain as one of the primary hard currency earners for the Soviets, thereby reducing the chances for uranium prices to recover in the near term. Mr. Combs believes that eventually a more competive economic system will lead to a return to a market more closely related to that of the 1970s than of the late 1980s.

Navigating the Nuclear Trade Winds: Charting a Course for the 1990s

James A. Glasgow of Muntzing and Glasgow discussed the current and potential legislative efforts that involve restricting the use of non-US uranium. Among the items he addressed were the voluntary overfeeding program that would require domestic uranium; Senator Wallop's draft bill requiring US utilities to use domestic uranium for two-thirds of their requirements; national security exceptions; bilateral nuclear cooperation agreements; and the trend toward reciprocal contracts. Mr. Glasgow feels that US participants in nuclear commerce appear to give only sporadic attention to the international institutions and bilateral agreements upon which their commerce depends. Areas such as proposed legislation, renegotiations of bilateral cooperations agreements, extension of the NPT, and other actions are important to the future of international commerce at the front and back ends of the nuclear fuel cycle, and industry participants should make an effort to identify areas where collective efforts are needed.

DOE Enrichment Update

The Uranium Enrichment Enterprise (UEE) is a vital part of the National Energy Strategy, asserted Philip G. Sewell, DOE's Deputy Assistant Secretary for Uranium Enrichment. He contends that the question is not whether the UEE is needed, but how it can best meet the needs of the nuclear industry. Mr. Sewell summarized the points that were reaffirmed by the Smith Barney study: with restructuring UEE can be more competitive, more reactive to market forces, deploy advanced technologies on an economic basis, and can exhibit a strong financial position by minimizing delays and maximizing market value. He stated that DOE's world market share is about 50 percent in 1991, and decreases to less that 30 percent by 1999. In addition, DOE was devoting particular attention to Soviet marketing practices in the USA and all sales with regard to fair trade practices. In response to a question of how AVLIS will be transferred, since deployment funds are not provided for in the FY 1992 budget request, Mr. Sewell stated that a restructured corporation will take R&D technology to the market more efficiently, and it is expected that the corporation will provide funds at the appropriate time.

Regulatory Implications for the Future of Nuclear Power

Robert W. Bishop of the Nuclear Management and Resources Council, reviewed the political issues and processes that seem to overwhelm the industry's ability to provide technical solutions to problems. It has been the tendency of regulatory agencies to address problems by adopting additional regulations, rather than focusing on the quality of regulatory activities. Standard design certification/combined licenses, and license renewal for reactors exceeding their 40-year term, are two major issues that are being addressed by the industry and the NRC to improve the regulatory process. Mr. Bishop believes that the industry can support these issues by ensuring that facilities operate properly, safely, and economically.

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The Economics of the Nuclear Fuel Cycle: What Makes a Fuel Manager's World Go Round?

John J. Stobbs of Nuclear Assurance Corporation (NAC) moderated a panel that addressed several questions involving the globalization of the nuclear fuel market. The global marketplace can offer utilities cheaper prices and diversification, but potential risks exist, including possible supply interruptions, or protectionism stemming from high import levels that have affected domestic programs. Though national security considerations are less a of concern to a utility than supply security, reliance on foreign supplies can reduce a country's ability to maintain its own sources and supply its own needs.

From a utility point of view, regulatory actions are less important in fuel purchase decisions than being competitive and keeping cost at the lowest level possible, while still maintaining reliability. A PUC panel member emphasized that regulatory actions encourage utilities to be more competitive, by establishing procedures and policies that make utilities perform rigorous analysis, with sound recommendations, and proper documentation and justification. In response to a question, Evan C. Rowe of the Public Utility Commission of Texas thought that a typical, acceptable utility contracting strategy would include a five-reload contract with a fuel fabricator, three different U_3O_8 suppliers, and one conversion services supplier.

Overview of Fuel Management Analysis

Julian J. Steyn of Energy Resources International examined utility procurement strategy development for the 1990s. Unlike the situation that existed in the 1980s, US utilities in the 1990s can obtain a range of services and uranium in a relatively free world marketplace with diverse and competitive sources. Utilities must now decide on an appropriate mix of spot market and long-term contracts; the choice will be related, in part, to the quantity flexibility and pricing terms offered in term contracts. To take advantage of these market changes, Mr. Steyn suggests that utilities develop a set of primary objectives as part of a procurement policy against which key fuel procurement decision alternatives may be evaluated. These objectives can be useful in developing a strategy to optimize procurement decisions, by providing a systematic approach that provides a basis for future internal policy reassessments, and substantiates the decision-making process in response to public service commission audits.

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WASHINGTON FOCUS

by Linda L. Gunter

Energy and the federal budget remained top agenda items within Congress in March. Energy Secretary Watkins testified before energy committees of both bodies of Congress on the Administration's National Energy Strategy (NES); the strategy was transmitted to Congress on March 6 as bills S 570 & HR 1301. Several Congressmen also have introduced energy legislation, including the National Energy Efficiency Act (S 741) sponsored by Sen. Tim Wirth (D-CO), and the Comprehensive Energy Strategy Act of 1991 (HR 1543) sponsored by the House Republican energy caucus which expands on the NES. President Bush is expected to issue an executive order which will require 20 percent cuts in energy consumption in all federal agencies by the year 2000. DOE testified in March before the House Appropriations subcommittee on Energy about the uranium enrichment program's budget. The Senate Energy & Natural Resources Committee held a hearing early in the month to consider DOE's request to purchase, rather than produce, SWU, and also to consider the effect of Soviet material entering the market.

DOE Considers SWU Purchase

◇ On March 7, DOE Assistant Secretary for Nuclear Energy, William Young, testified before the House Appropriations Subcommittee on Energy & Power. Most of the testimony was devoted to DOE's budget for its waste clean up program, and advanced reactor funding. However, Mr. Young was also questioned about DOE's decision to purchase, rather than produce SWU, as long as the purchase price is below DOE's cost of production. Young said the emergence of the Soviet Union as a long-term supplier "represents a serious market threat that should be addressed promptly." While asking Congress to again consider restructuring legislation, DOE has taken initial steps to be competitive in the future. Young said DOE has begun to make offers in the 1996-1998 period that "in a free market with fair trade practices, ...will be attractive to potential customers..." DOE is projecting net revenue of $159 million in FY 92, up from $110 million in FY 91. Although DOE will increase spending on environmental corrective actions by 36 percent over FY 91, lower-priced power costs will offset this anticipated increase.

Enrichment Legislation

◇ The Senate Energy & Natural Resources Committee held a hearing on Sen. Wendell Ford's enrichment restructuring bill (S 210) on March 7. DOE Deputy Secretary Henson Moore, and Nick Timbers, Managing Director from Smith Barney Harris Upham & Co., Inc., were the two principle witnesses. DOE testified of its urgent need to restructure because of growing competition in the market. If Congress does not pass legislation to allow DOE to become more competitive, DOE may lose its commercial customers, and the taxpayer would then incur an additional $300 million in added costs for servicing military SWU requirements. Sen. Malcom Wallop (R-WY) asked if the Soviets were dumping SWU. DOE is studying the Soviets' presence in the market and plans to have a report finished by April 15.

Proposed Legislation to Limit Affect of Soviet Uranium Imports

◇ Sen. Wallop revealed that he is considering legislation which will help the domestic uranium industry and start an investigation into Soviet uranium marketing practices. The draft bill calls for a study to determine if the Soviets are dumping natural and enriched uranium. A key section of the bill would require,

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after 1995, that all civilian reactor owners purchase at least two-thirds of their fuel materials from US sources. The bill would require an annual report from reactor operators on the origin of the uranium and EUP in their reactors, but would protect a utility from PUC oversight of its uranium procurement if the utility purchased US origin material. DOE was asked for its comments on the bill but has not yet responded. Industry is concerned because the obvious anti-free trade elements of the bill, especially with regard to possible illegality under GATT and the US-Canada Free Trade Agreement. In addition, if this bill becomes an amendment to the enrichment restructuring bill S 210, it could create more problems and delay Senate passage of restructuring legislation.

Fernald Material

◇ Sen. Pete Domenici (R-NM) agreed with Sen. Wallop that foreign uranium imports are a problem for the mining industry, but indicated he was more concerned about what the US government has done to injure the industry. He referred to recent news reports that DOE plans to sell fuel scraps from Fernald and Hanford from the weapons program. Moore agreed to look into the issue, and consult with the committee prior to any sale which could have an adverse affect on the domestic uranium industry.

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INDUSTRY BRIEFS

Hungary to Continue to Use Soviet Fuel Cycle Services

The management of Hungary's Paks Nuclear Power Station reached an agreement with Atomenergoexport of the Soviet Union for the purchase of fabricated fuel for use in Paks' four VVER-440 units. A major factor in the choice of Atomenergoexport was that the Paks station's spent fuel will likely be taken by Atomenergoexport for final disposal in the Soviet Union. The contract covers the entire operational life of the Paks units. Paks' management sought competing western offers, but no other offer contained a provision for the final disposal of spent fuel. Unlike prior fuel supply contracts with Atomenergoexport, the contract requires that Atomenergoexport be paid in hard currency, not in transfer rubles; payments will be negotiated annually.

In a separate contract, the Soviet Union agreed to purchase the yellowcake needed to produce the Paks fuel from the Mecsek mine (now a Hungarian-Irish joint venture; Monthly Report #268, Dec. 1990, p.19), at a price that can be evaluated as equivalent to world market prices.

Denison Temporarily Suspends Elliot Lake Operations

Denison Mines Ltd. announced that operations at its Elliot Lake uranium production facility have been suspended for six weeks, as of March 15. On June 28, another 400 jobs will be cut from the remaining work force of 1,060 people, and operations will again be suspended, this time for a seven–week period, during which time maintenance work will be performed.

These measures are being taken to reduce costs, while decreasing mine production to a level equivalent to Denison's delivery commitments to Ontario Hydro (1.4 million pounds U_3O_8 per year). Due to high production costs, Denison cannot profitably supply Tokyo Electric Power Corporation (TEPCO) under its existing sales agreement. Denison plans to fulfill its delivery obligations to TEPCO utilizing U_3O_8 produced from the recently formed joint-venture with Freeport-McMoRan.

German Ruling Party Supports New PWRs in Former GDR

The German coalition government, in particular, the ruling Christian Democrat Union, announced its support of a plan to build two new 1,300-MWe PWRs by 1996. Both units would be located in eastern Germany—one at the Greifswald site located in the state of Mecklenburg-Vorpommern, and one at the Stendal in the state of Saxony-Anhalt. Premiers of both these states have said they will support utility investments for the construction of the new nuclear plants. Much of the support of the plan comes from those groups that want Germany, particularly eastern Germany, to achieve an improved mix of fuel sources for electricity generation. With the closing in the past year of all of the former East Germany's Soviet-designed reactors, eastern Germany now uses lignite coal to fuel nearly all of its electricity generation.

However, the opposing Social Democratic Party (SDP) has vowed to prevent construction of the reactors, and German utilities are reluctant to begin new nuclear plant construction without full assurances from German authorities that the plants would be completed.

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JAERI Breaks Ground On High Temperature Test Reactor

On March 15, the Japan Atomic Energy Research Institute (JAERI) broke ground for a ¥80 billion (approximately US$615 million) High Temperature Engineering Test Reactor (HTTR) at its Oarai Research Establishment. The reactor is scheduled to achieve criticality in 1995-1996.

The 30 gigawatt (thermal) reactor will utilize specially-fabricated uranium-dioxide (UO_2) fuel, mixed in various enrichments ranging from 3 w/o to 10 w/o ^{235}U, and placed in a graphite reactor core. JAERI expects the primary coolant (helium) temperature to attain a maximum value of 950°C at the reactor exit, nearly triple the typical exit temperature of current light water reactors.

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DOE Awards NPR Construction Management Contracts

DOE has awarded two construction management contracts (each worth up to $4 million) for the first US New Production Reactor (NPR). Winners of the contracts are Bechtel National Inc., for a heavy water reactor at the Savannah River site, and Fluor Daniel, for a modular high-temperature, gas-cooled reactor (MHTGR) at the Idaho National Engineering Laboratory. Late this year, DOE will select which technology it will pursue through to the completion of a demonstration plant.

Swiss Government Supports Increase in Nuclear Plant Capacities

Swiss government officials recently announced their support of a plan to increase generating capacities of the country's nuclear power plants by at least ten percent by the year 2000. On September 23, 1990, Swiss voters passed a referendum that imposed a 10-year moratorium on all nuclear power plant licensing and construction. Therefore, increasing unit capacities is the only current option available for nuclear power to contribute to the nation's growth in generating capacity. Swiss utilities had proposed the capacity increases (ranging from 10 to 15 percent per unit) in May 1990, when substantial public opposition to construction of a sixth nuclear plant was already evident (Monthly Report #262, June 1990, p.20).

German State Issues Siemens MOX Plant License Before Greens Take Office

On March 12, in an action clearly timed to beat the incoming anti-nuclear party's taking of office, the Minister of Environment for the German State of Hesse, Karl-Heinz Weimar, issued Seimens a definitive license for the company to operate its mixed-oxide fuel production facility in Hanau. Operation of the plant is opposed by the incoming coalition of the Social Democratic Party (SDP) and the Green Party, who took office on April 5 after achieving a narrow victory in January 20, 1991 state elections. Environmental Minister Weimar recognized that the incoming government would attempt to stop MOX production with challenges to the license, so he attached a rider to Siemens' license which allows the plant to remain in operation pending resolution of any legal challenges.

Licensing of the MOX facility concludes a 15-year relicensing process of all of Germany's fuel cycle facilities, following a 1975 revision to the German Atomic Act. The revision required all fuel cycle facilities license approvals to be based upon the same criteria applied to nuclear power plants. Issuance of the license opens the option for plutonium, previously shipped to France and the UK for reprocessing, to be returned for MOX fuel production in Germany.

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RÖSSING URANIUM LIMITED

The government of Namibia, celebrating the first anniversary (March 21) of the country's independence from South African rule, is looking to Rössing Uranium Limited (RUL) to improve the economic health of the country. RUL is Namibia's largest employer, producer of one third of the country's exports and 13 percent of its domestic product. The Rössing mine is the second largest uranium mine in the world, producing over 108 million pounds U_3O_8 from 1976 through 1989, and still holding an estimated 322 million pounds in reserves. Yet Rössing is one of the lowest grade uranium deposits ever commercially exploited, with an average grade of only 0.035 w/o U_3O_8. To efficiently develop such a low-grade deposit, RUL uses extensive real-time cost analysis systems and has the highest rock production rate (ore plus waste) of any uranium mine in the world, over 300 thousand tons per day.

History

Prospectors working in a remote part of Africa's Namib Desert, near Rössing Mountain in Namibia, first discovered uranium in 1910. In 1928, Captain P. Louw and his wife Margery, discovered a heavy, black mineral at a site about 20 kilometers west of today's Rössing mine, and confirmed its radioactivity. Sporadic prospecting throughout the concession area into the 1940s resulted in the discoveries of widely-disseminated uranium-bearing rocks.

In 1955, the Louw Syndicate was formed to once again locate Captain Louw's original find. In 1954, when the find was located, the Louw Syndicate obtained a prospecting grant for the concession area. A short time later, Anglo American Prospecting Company of South Africa secured a two-year prospecting and option agreement with the Louw Syndicate, for the investigation of the commercial potential of the 1,200 square mile concession area. During this investigation, the first concerted action toward geologic assessment of the area, Anglo American identified a number of radioactive anomalies. During the evaluation process, geologists delineated highly-disseminated mineralization averaging approximately 0.035 w/o U_3O_8. However, Anglo American let the option period expire without taking any further action. In 1965, the concession area was reduced to 400 square miles.

In 1966, RTZ expressed an interest in the Namib property. RTZ Corporation plc (formerly Rio Tinto Zinc Corporation plc), is a British corporation originally formed in the 1800s to exploit copper deposits in Spain. RTZ has since grown into one of the world's largest mining companies with major interests in copper, borax, iron, aluminium, and uranium. RTZ's uranium interests include mines and deposits in Australia, Canada, Namibia, South Africa, and the USA. RTZ had declined participation in development efforts on two previous occasions. The renewed interest of RTZ was attributable to two promising developments:

- Emerging long-term uranium marketing opportunities;
- Improvements in large-scale mining and mineral recovery technology.

RTZ assigned its South African subsidiary, Rio Tinto South Africa Ltd., to perform an evaluation of the property. Following favorable results of the evaluation, RTZ negotiated a six-year option with the Louw Syndicate, and set out to perform geological studies. In 1970, following further favorable results from varied testing, RTZ created a subsidiary, Rössing Uranium Limited, to operate the project. The project's mill, built on site, produced its first U_3O_8 in mid-1976. Though initially hampered by numerous problems, production did reach a rate of 10 million pounds U_3O_8 per year by 1979—a production rate second only to that of the Canadian Key Lake project.

Capital Costs

By mid-1976, RUL had invested US$350 million for the initial capital costs of the Rössing project. An additional $35 million has been invested over the past three years in order to achieve the full-rated capacity of the plant; 16.5 million tons of ore per year.

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Ownership

Namibia became an independent nation on March 21, 1990, via a United Nations' negotiated settlement for the release of Namibia from 70 years of South African control. Following its independence, Namibia's new government has a majority voting interest (51%) in RUL, although the government holds only a 3.4% ownership interest (since 1987, and held through Capricorn Trust). In the mid-1970s, RTZ sold shares in RUL to a diverse group of mining and investment companies. Holders of the beneficial interests in Rössing Uranium Ltd. are shown in **Table 1**.

Table 1
BENEFICIAL INTERESTS IN RÖSSING URANIUM LIMITED

Company	Country	Share
The RTZ Corporation plc [1]	UK	41.4%
Industrial Development Corp.	South Africa	10.0%
Total Compagnie Minière	France	10.0%
Rio Algom Ltd. [1]	Canada	10.0%
Urangesellschaft GmbH	Germany	5.0%
Capricorn Trust [2]	Namibia	3.4%
General Mining Corp.	South Africa	2.3%
Undisclosed [3]	—	17.9%

[1] RTZ owns 51.3% of Rio Algom, so RTZ's net beneficial interest in Rössing is 46.5%.

[2] The Capricorn Trust was established in 1987 to hold and manage Namibia's share in Rössing. Dividend income is used for educational and other benefits for Namibia's people.

[3] 17.9% is held by several companies or national entities that participate under strict provisions of secrecy, and have therefore not been publicly disclosed.

Uranium Policy Considerations

With Namibia's new ruling party's assumption of office last year came considerable uncertainty about policies dealing with the mining industry. SWAPO (South West African People's Organization), the newly-elected ruling party, had indicated that nationalization of the mining industry might occur, despite a moderate pre-election position. An early policy document stated that mining projects might carry government ownership requirements in the future. The government was quick to comment that any ownership changes, should they occur, would be enacted gradually to avoid production disruptions.

The mining industry remains an attractive target for nationalization since it accounts for 80 percent of Namibia's exports, and more than one third of its domestic revenue. However, the new government does not want to discourage foreign investment. A study by the new government (completed in July 1990) recommended that the state should boost its earnings by increasing taxes on mining, rather than changing ownership.

In early February 1991, the current Director of Mining, Mr. K. Kapwanga, eased some concerns of the mining industry when he announced details of the soon-to-be-adopted Mines and Minerals Act–1991. Existing grants and other titles held under the terms of the current Mines, Works, and Minerals Ordinance of 1968 are to remain valid, and will remain so for at least three years. During those three years, conversions to equivalent rights available in the new act will be offered. Under the new act, medium and large-scale operators will be able to obtain a short-term reconnaissance license, with an initial term of three years, as well as a mining license that grants the exclusive right to mine exploitable minerals. Small-scale miners will be entitled to non-exclusive prospecting licenses. If market prices discourage short-term development, those holding exclusive prospecting licenses will have the option of applying for a mineral deposit retention license, which allows holding the property for later development. The initial term will be for five years, subject to regular review of the license holder's intentions.

Sales

RUL's production strategy is to produce to meet contracted deliveries. In 1989, production was about 80 percent of rated capacity, reflecting the expiration of most of the long-term supply contracts that were originally signed with utilities in the UK, France, Germany, Japan, Spain, Taiwan, and the USA, as well as the impact of US economic sanctions against South Africa and Namibia under the Comprehensive Anti-Apartheid Act of 1986.

RUL has future commitments under long-term contracts with utilities in Europe, Japan, Taiwan, and the USA. Since Namibia's independence, RTZ Mineral Services Ltd. (a wholly-owned subsidiary of RTZ Corp. that handles all sales of RUL uranium) has signed a supply contract with the French nuclear power generating industry for 10.4 million pounds of U_3O_8, for delivery during the period of 1995 to 2002. On March 21, 1991, coincidental with the one-year anniversary of Namibia's independence,

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RTZ Mineral Services announced in a press release the signing of RUL's first supply contract in the USA since Namibian independence. The buyer is Gulf States Utilities Company of Beaumont, Texas; RUL will supply up to 50 percent of Gulf States' requirements for the period 1991 through 1997.

RUL currently has negotiations underway with other potential customers, including several Japanese utilities. To promote these and other market opportunities, the Namibian government recently set up an office in Tokyo.

Namibia's introduction of its own monetary unit, the Namibian dollar, in 1993, may also have an effect on the competitive price of Namibian uranium in the future. One Namibian dollar will initially be set at parity with one South African Rand.

Location

The production center for the Rössing project is located in west-central Namibia, 23 kilometers inland from the Atlantic seaside town of Swakopmund, and 200 kilometers west of the city of Windhoek, Namibia's capital. The Rössing operations are situated at the northern edge of the Namib-Naukluft National Park. This park encompasses almost half of the Namib Desert, which extends along nearly the entire coast of the country in a 100-kilometer-wide strip, and is a vast area of sandy wastes, barren mountains, and sparse vegetation.

Geology

Current reserves at Rössing are estimated at 322 million pounds, at an average grade of 0.035 %U_3O_8. RUL is also performing exploration work in west-central Namibia, near Otjiwarongo and Spitzkoppe Mountain. Expenditures for exploratory drilling will exceed 3 million rands in 1991.

The Rössing uranium deposit occurs in rocks identified with the Damaran Orogeny, which has an estimated geologic age between 500 and 600 million years. The Damaran orogenic belt extends for several hundred miles in a northeast-southwest direction. It extends through Namibia (covering most of the Namib Desert region), northward into southern Angola, and possibly as far east as Zambia. The granitic intrusions and metamorphism characteristic of the Damaran orogenic belt are especially evident in an area around Rössing Mountain. It is within this area that the Rössing uranium deposit occurs.

The bulk of the economic mineralization is contained in the uranium-bearing intrusions of alaskite granite. Uraninite is the most important primary uranium mineral present in the deposit, constituting about 55 percent of the total uranium contained in the rock. The primary mineralization occurs in close association with concentrations of quartz, feldspar, and biotite, in the alaskite granite. The determined outline of mineralization measures approximately three kilometers long and one kilometer wide. Migration of uranium mineralization into normally barren country rock is a common occurrence, however, minable quantities rarely occur.

The origin of uranium minerals at Rössing is probably related to the emplacement of the granites in the area. The primary minerals were included as an integral part of the rock-forming process. The ore zones with high-grade concentrations probably developed as a result of segregation or banding that occurred in the early stages of consolidation (cooling) of the igneous rocks.

Mining

The Rössing project is an open-pit mine with reserves that are expected to last at least through 2020. The pit measured approximately three kilometers long, one kilometer wide, and 225 meters in depth (**Figure 1**) as of 1987. The ultimate depth will be approximately 330 meters. The Rössing mine produced 38,000 to 44,000 tons of ore per day during 1989. Based on a stripping ratio of three-to-one (waste-to-ore), total rock production was 160,000 to 176,000 tons per day.

According to RUL managing director Dr. Michael Bates' recent statements, RUL production would be cut by 21%, as of April 2, 1991, and remain at that level for three years. The production cuts are due to lagging sales, which Dr. Bates attributed to the remaining effects of past trade sanctions, world oversupply, and the influx of uranium from former East Bloc countries.

Despite the large daily tonnage, mining practice is selective to maintain both the uranium grade and the calcium index (a measure of the acid consumed during leaching) within predefined limits. Due to the complex nature of the mine, planners and grade control engineers have the responsibility of optimizing the operation. Computers are used extensively to determine the lowest-cost haul route, as well as the best metallurgical efficiency, to produce U_3O_8 at the lowest possible cost.

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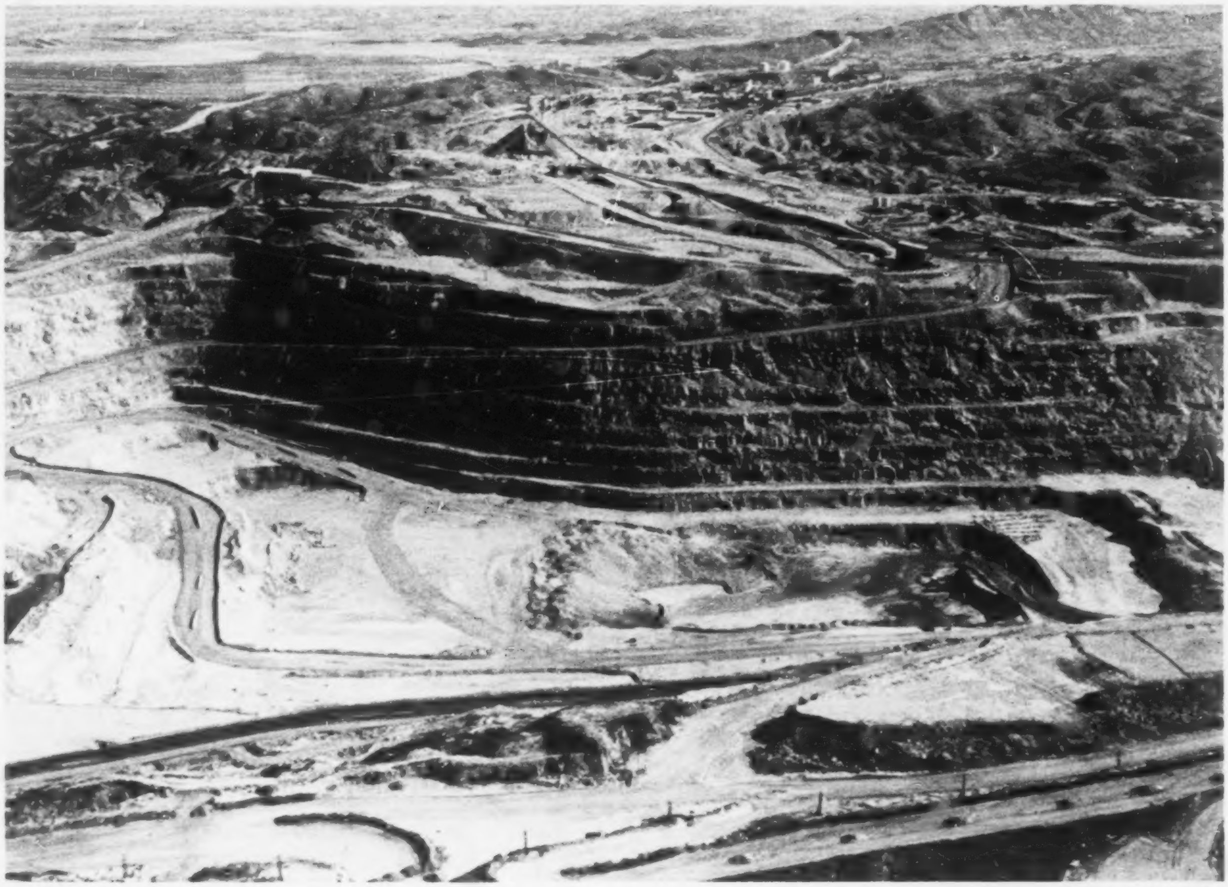

Figure 1 – An elevated view of the Rössing mine, displaying the large 3 km deep, 1 km wide, and 225 m deep pit. The mine has the highest production (ore plus waste) of any uranium mine in the world.

Such a large scale and extensive operation requires the use of large-scale equipment. Major mining equipment includes:

- *Six–GD 120 blast hole drills.* Production holes are drilled 380mm in diameter. Blasting is done with a high-density mixture of Anfo with an emulsion (ammonium nitrate,waste oil, and an emulsifier).
- ***Eight**–P&H 2100 electric shovels* (11.5-cubic-yard buckets). Recently two Dresser model 201M 24-cubic-yard shovels have been added.
- *Six–Rubber-tired dozers;* three are Caterpillar model 82s, and three are Michigan model 280s.
- ***Twenty**–Wabco 170-ton diesel-electric haul trucks.* During 1986, eighteen trucks were converted to trolley-assist operation, to improve haulage speeds and lower fuel costs.

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Grade controllers examine the assays on every blast plan, and trucks are radiometrically scanned in order to determine an optimal mill feed. The scanned trucks are directed to waste dumps, low-grade stockpiles, high-calcium stockpiles, or primary crushers.

Milling

The mined ore is dumped directly into one of two 54-inch gyratory crushers, reduced to minus 160 mm, and then passed directly to a 440,000-ton capacity stockpile. Secondary crushing is done by two 84-inch Symons standard crushers, which reduce the ore to minus 65 mm. The ore is then screened at 19 mm, with the oversized ore then crushed in a tertiary crusher in closed circuit with the screen. The fine ore stockpile has a live capacity of 20,000 tons, and a total capacity of 88,000 tons. The capacity of the crushing plant is 2,750 tons per hour. The fine ore is further reduced to minus 1.7 mm in four parallel rod mills, each with a capacity of 550 tons per hour. Water is added to maintain pulp density.

The entire metallurgical operation is controlled by a centralized computer system. The rod mill discharge is first fed into the leaching circuit, where manganese dioxide is added to oxidize the uranium, then sulfuric acid is added to leach the uranium. The retention time in the leaching circuit is 13 hours.

The leached product is then separated, with the sand particles sent directly to the tailings pile, and the uranium-rich slimes are sent to a counter-current decantation (CCD) circuit for washing and separation. The separation produces a uranium-rich solution, and a thickener slime—the latter is sent directly to the tailings area.

The uranium-rich solution leaving the CCD is upgraded at an ion-exchange plant. The solution is next run through resin beads in a fluidized bed. The uranium-bearing resin beads are transferred to a fixed-bed system for elution with a 10% sulfuric acid solution. The acid eluate is transferred to the solvent extraction plant where this eluate is first mixed with an organic solvent, followed by an ammonium sulfate solution. Gaseous ammonia is added to precipitate the ammonium diurinate (yellowcake). The ammonium diurinate is washed, filtered, dried, and calcinated at 700°C, and then crushed and packaged for shipment.

Table 2
Rössing
Historical Uranium Production

Year	(1,000 pounds U_3O_8)
1976	1,544
1977	6,083
1978	7,012
1979	9,983
1980	10,508
1981	10,324
1982	9,817
1983	9,619
1984	9,600
1985	8,801
1986	9,026
1987	9,215
1988	9,127
1989	8,001
1990*	8,000
1991*	6,900
1992*	6,500

* Estimated

Conclusion

The Rössing operation remains one of the uranium industry's more interesting projects: very large but low-grade reserves; world's highest rock production rate; and a large-scale computerized production cost management system. The release of Namibia and its products from nearly four years of multi-national anti-apartheid sanctions offers Rössing Uranium Limited the opportunity to use its unusual assets to gain a position as a volume supplier to the world market. Managing Director Dr. Bates recently stated that RUL management has established good relationships with government officials, is encouraged by the attitude shown by the new Namibian government, and is optimistic about long-term market opportunities.

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CONVERSION AND ENRICHMENT IN THE SOVIET UNION

NUEXCO's November 1989 Report (No. 255, p. 21) presented an interview with Mr. Boris V. Nikipelov, First Deputy Minister of Atomic Energy and Industry (MAEI) in the USSR, in which Mr. Nikipelov discussed the technical and commercial activities of the Ministry. This article, summarizing conversion and enrichment in the Soviet Union, is based on information provided by Mr. Nikipelov and his colleague, Mr. Anatoly A. Vlasov, during a recent visit to the Soviet Union by Contributing Editor R. Wesley Miller. Although some technical and commercial details remain classified, the article contains much previously unavailable information, such as a conversion process flow chart and photographs of a gas centrifuge enrichment facility.

Introduction

In the Soviet Union, just as in the West, the civilian nuclear industry emerged from research work undertaken for nuclear weapons development. At first researchers tried various techniques for physical separation of uranium isotopes: electromagnetic and molecular-kinetic thermo-diffusion methods; gaseous diffusion; and centrifuge methods. All of those methods, which are based primarily on differences in the atomic mass of uranium isotopes, called for extensive research and the development of new, technically unprecedented equipment. Gradually gaseous diffusion and gas centrifuge technology became recognized as most feasible for industrial use, so research on other methods was terminated. Industrial-scale uranium enrichment in the Soviet Union began in 1949 using the gaseous diffusion method; by the early 1960s, centrifuge technology was in use on an industrial scale.

All Soviet production of highly-enriched, weapons-grade uranium was halted in 1987. The Soviet Union now has four enrichment plants in operation (at classified locations), solely for civilian nuclear power needs. All four enrichment plants have centrifuge modules, and enrichment provided by gaseous diffusion accounts for less than five percent of their total output. Two of the four enrichment plants also incorporate facilities for conversion to uranium hexafluoride (UF_6).

Conversion Technology Development

The Soviet Union began developing UF_6 conversion technology in 1947. Initially, this technology was based upon direct fluorination of mixed uranium oxide in single-tube horizontal reactors equipped with mixers, but it was inefficient compared to fluorination of uranium tetrafluoride (UF_4), a process that was being developed in parallel. That process was based on a sulfate system, which included the dissolving of U_3O_8 in sulfuric acid, the electrolytic regeneration of uranyl sulfate and, at the final stage, hydrofluorination. The fluorination of UF_4 used horizontal tube reactors which had a production capability of 1.0 to 1.2 tons per hour.

In 1956, the introduction of twin-tube fluorators improved the utilization of fluorine and increased production capacity to 2.5-8.0 tons UF_6 per hour. In 1965, the introduction of flame reactors (fluorination in dust infusions) made possible the fluorination of both UF_4 and uranium oxides. Design of the first generation of flame reactors included air-cooled retorts. Subsequently, water-cooled retorts were developed and introduced, thereby improving productivity.

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Current Conversion Technology

As shown in **Figure 1**, conversion of natural uranium oxides or UF_4 to solid UF_6 takes place in a balanced, continuous cycle that incorporates six principal steps.

- Pure anhydrous hydrogen fluoride (HF) is produced from the thermal decomposition of fluorspar (CaF_2) with sulfuric acid (H_2SO_4) in revolving, high-temperature furnaces. The final product, greater than 99.9% pure HF, is derived via fractional distillation.
- Elemental fluorine gas (F_2) is produced by the electrolytic decomposition of hydrogen fluoride in molten KF•2HF. A sufficiently high voltage causes electron transfers to occur at the electrodes in the following chemical reaction, which is carried out at 800°C to 1000°C.

  $$2HF \xrightarrow[\text{molten KF}\bullet\text{2HF}]{\text{electrolysis in}} H_2 + F_2$$

  This step uses high-output electrolyzers with carbon anodes that carry a current up to 20 kA and an electrolyte acidity of 36-39 percent. The service life of the electrolyzers (of the gas-separating bell, for example) is 7,500 hours; anode service life is up to 10,000 hours.
- Powdered natural uranium is fluorinated, with subsequent cooling of the reaction gases and filtration of solid impurities.
- Solid UF_6 is sublimed from the gas flow.
- Fluorine and uranium-bearing products are recovered from the gas flow of the primary uranium-bearing product stream.
- Liquid and gaseous by-products are neutralized.

The apparatus used for high-temperature single-stage fluorination includes a water-cooled vertical flame reactor, a reaction gas cooler that uses condensation-vaporization heat-exchange processes, and ceramic filters. Each unit has a capacity of 50 tons per day and is made primarily of nickel and monel-metal, resulting in a service life for the sub-assemblies (the reactor retort, mixer) of five years or more. The reaction gas cooler reduces temperatures from 600°-650°C (upon exiting the reaction zone) to 80°-100°C, extending the service life of ceramic filters and increasing the overall capacity of the direct fluorination process.

Gaseous Diffusion

The separation stage of a Soviet gaseous diffusion cascade consists of a cylindrical vessel enclosing two high-capacity compressors, several rows of fine, porous, tube-like filters, and two coolers. The compressors raise the gaseous UF_6 pressure to the required level. The coolers reduce the UF_6 temperature as it enters the separator after exiting the compressor. Under a vacuum, the lighter UF_6 molecules ($^{235}UF_6$) pass through the pores faster than the heavier UF_6 molecules ($^{238}UF_6$) so that the gas that passes through the filter becomes slightly enriched (weight-percent of ^{235}U isotope greater than its natural fraction of 0.711 w/o) while the remaining gas becomes slightly depleted (in ^{235}U). This process is repeated many times through connected separation stages to achieve the cascade effect. (Each pass through a filter constitutes one stage.) This gaseous diffusion cascade consists of over 1,000 stages, each of which is driven by a powerful compressor. Practically all the energy consumed by the gaseous diffusion process is given off as heat, which must then be drained off using temperature-controlled water (to avoid the thermal shock that could be caused by using water with too low a temperature). Electricity accounts for nearly half of the total operating cost of a gaseous diffusion enrichment plant. Thus, a high consumption of electricity remains both the defining characteristic and the greatest shortcoming of gaseous diffusion technology for uranium enrichment.

The first gaseous diffusion uranium enrichment plant in the USSR started operating in the Urals (near Sverdlovsk) in 1949, but it was relatively inefficient. During its first four years, researchers did a large amount of development work for subsequent application to industrial equipment and technologies. The most critical technical issue was the design of a compressor that could achieve the required throughput and degree of compression. In the development of such a compressor, uranium hexafluoride's unique aerodynamic qualities presented problems that could not be resolved by experimentation with ordinary gases. A radial (centrifugal) compressor design was chosen for various reasons, including limitations on Soviet machine-tool capabilities at the time. A rather simple design, it was significantly less efficient than the axial, multistage compressors used by France and the USA.

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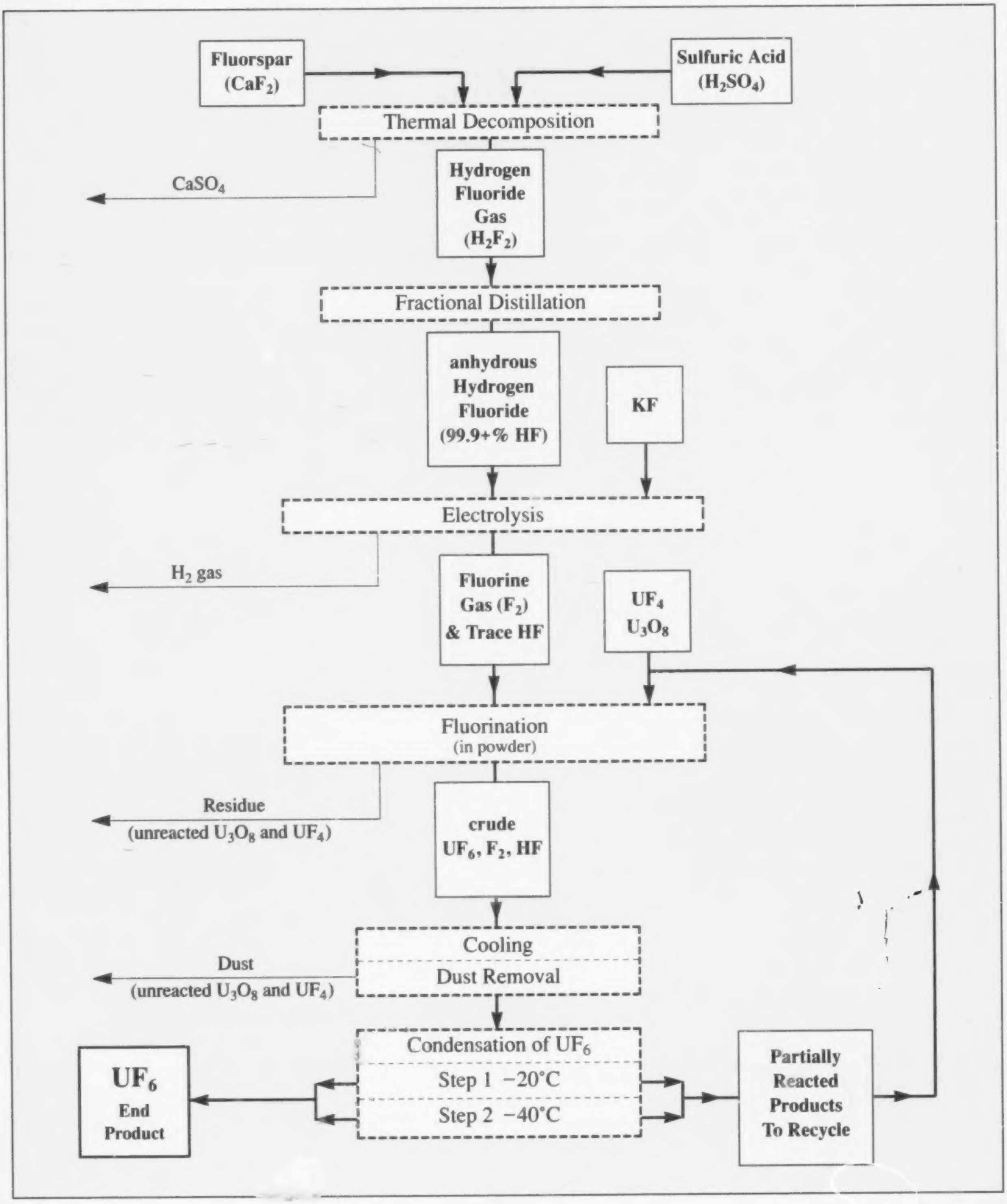
Figure 1
SOVIET CONVERSION PROCESS FLOW DIAGRAM


Fluorspar (CaF_2)
Sulfuric Acid (H_2SO_4)
Thermal Decomposition
$CaSO_4$
Hydrogen Fluoride Gas (H_2F_2)
Fractional Distillation
anhydrous Hydrogen Fluoride (99.9+% HF)
KF
Electrolysis
H_2 gas
Fluorine Gas (F_2) & Trace HF
UF_4 U_3O_8
Fluorination (in powder)
Residue (unreacted U_3O_8 and UF_4)
crude UF_6, F_2, HF
Cooling
Dust Removal
Dust (unreacted U_3O_8 and UF_4)
Condensation of UF_6
Step 1 −20°C
Step 2 −40°C
UF_6 End Product
Partially Reacted Products To Recycle

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Radial compressors were also used in later Soviet gaseous diffusion plants. **Figure 2** and **Figure 3** show interior views of a retired gaseous diffusion plant formerly used for weapons purposes. The inefficiency of radial compressors was one of the primary factors motivating the Soviet Union's intensive development work on gas centrifuge enrichment in the early 1950s.

The gaseous diffusion plants operated reliably, with repair intervals of seven to nine years. Air intrusion to the interior of the compressor along the rotating shaft was prevented by using precision seals with long service lives. The primary cause of unscheduled shut-downs was insufficient reliability of the compressor unit and electrodrive bearings.

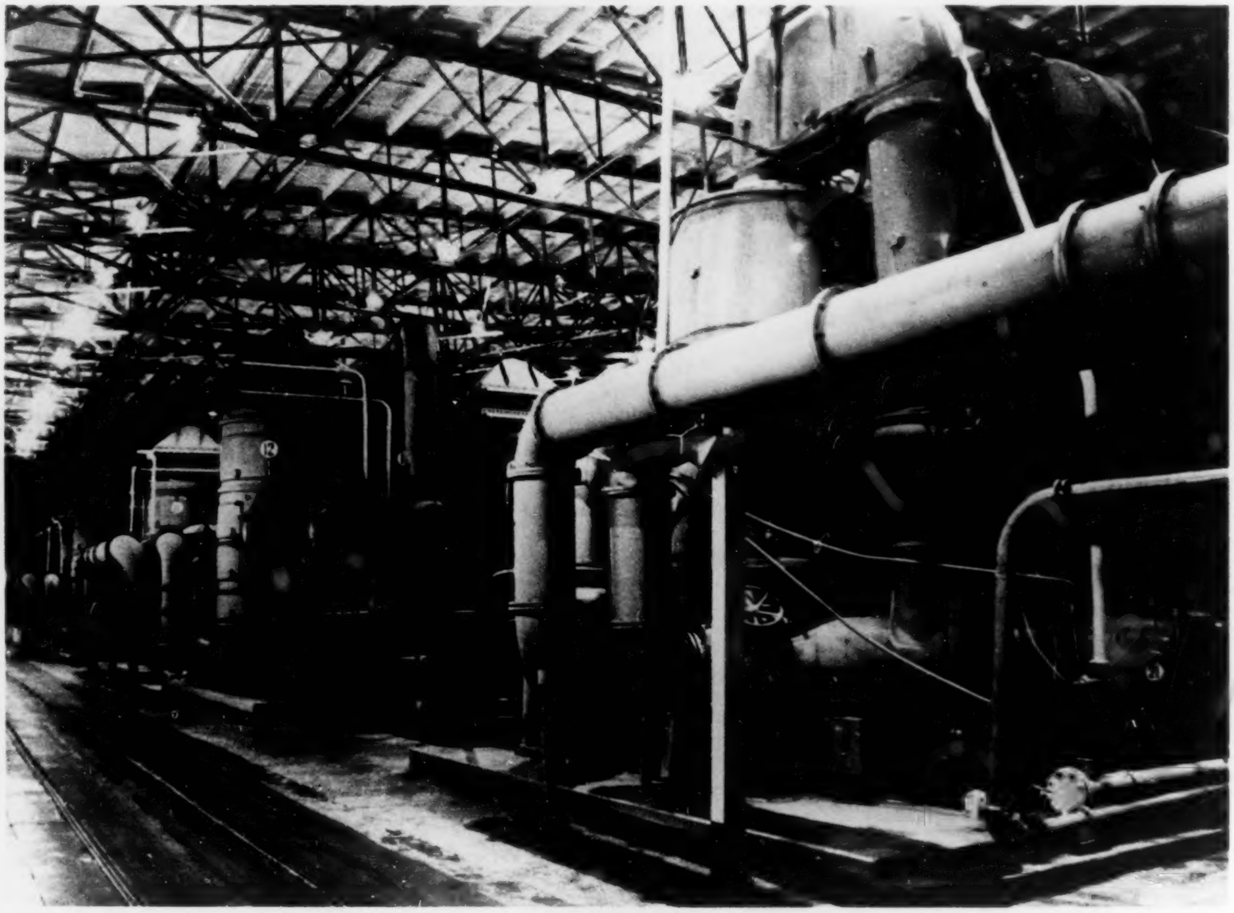

Figure 2 – Interior view (first of two; see also Figure 3) of a retired gaseous diffusion plant, formerly used for weapons production. *(Photo Courtesy of MAEI).*

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The development of effective isolation filters was the primary and most complex problem of gaseous diffusion technology. Without effective seals to maintain the required high vacuum, effective filter operation, both in the separation cascade and the cascade as a whole, is impossible. However, when gaseous diffusion technology was first introduced, vacuum technology was just in its infancy. The country's first leak detector with a sensitivity meeting operational requirements (24 µm Hg per day) was developed specifically to solve that problem. This instrument, a mass spectrometer which is fed a mixture of helium and nitrogen, had sufficient sensitivity, required minimal care, and reacted quickly—characteristics especially important in checking the tightness of large vessels.

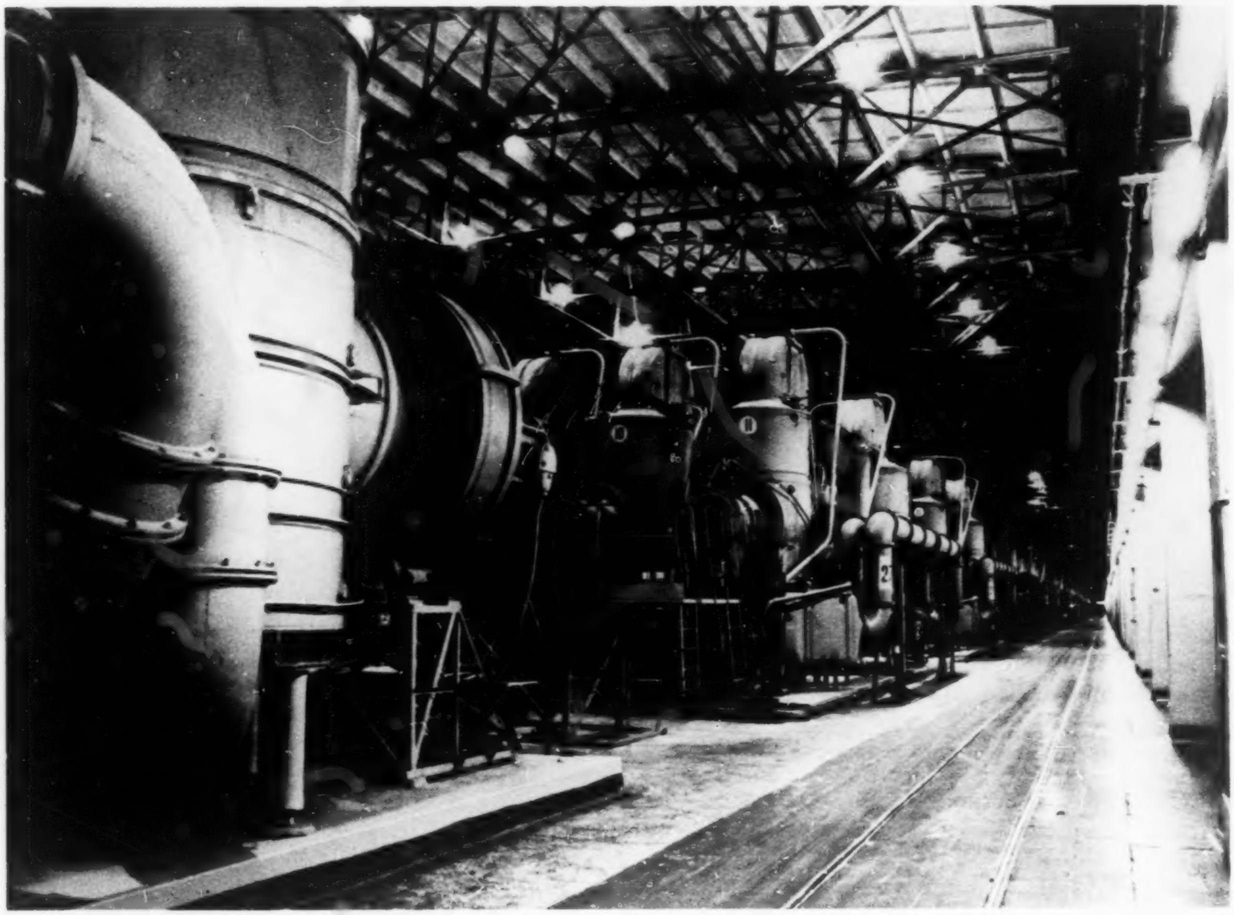

Figure 3 – Interior view (second of two; see also Figure 2) of a retired gaseous diffusion plant, formerly used for weapons production. *(Photo Courtesy of MAEI).*

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Filters used in the gaseous diffusion process must have a number of special qualities.

- The dividing layer (of 0.01 mm thickness) must have a uniform, high degree of porosity (average radius 1/100th of a micrometer).
- The filters must maintain their separating capability for several years of operation in the highly-corrosive uranium hexafluoride environment.
- The mechanical strength of filters must allow operation for extended periods under conditions of fluctuating pressure and vibration.

The technology for manufacturing a nickel separating filter is based on methods of powder metallurgy (preparation of powders, rolling and sintering, application of the separating layer, and so on). A filter is made with two layers, one carrier and one separating layer. Made primarily of nickel, the separating filter is a tubular structure 550 mm long and 15 mm in diameter, with a thickness less than 0.1 mm. Operating experience has shown that such filters are highly effective for the gaseous diffusion stage design adopted, have good separation characteristics, and can operate without reconditioning for over ten years. On the whole, the technology introduced for making separating filters exhibited good flexibility, since it permitted constant improvement of the filters themselves without overall redesign.

Gas Centrifuge Technology

The fundamental advantage of the gas centrifuge method over gaseous diffusion arises from the fact that the primary isotope separation effect occurs at thermodynamic equilibrium. Thus, gas centrifuge enrichment uses only about 1/20th to 1/30th of the electricity per SWU required by gaseous diffusion. The plant can be built with the right number of centrifuges to bring it close to its ideal cascade size with almost no separative work losses. Lastly, gas centrifuges require low working inventories of UF$_6$, which ensures a high degree of production flexibility, such as when altering the cascade for a different final product or tails assay.

A Soviet gas centrifuge utilizes a rotor turning at high speed in a vacuum chamber (pressure 10^{-4} to 10^{-5} mm Hg). The rotor contains gaseous UF$_6$. The action of centrifugal forces causes a partial separation of isotopes along the radial axis: near the rotor axis, an excited layer of gas is enriched in light ^{235}UF$_6$ molecules; at the periphery an excited layer of gas is slightly depleted (in ^{235}UF$_6$ molecules). The axial counterflow motion of these two excited layers of gas converts the initial radial isotope separation effect into an axial one, enabling that effect to be multiplied. The two layers of gas—enriched and depleted—are removed from the rotor face through a series of tubes. (For separation in the rotor, gas is fed in through a separate tube.)

In a gas centrifuge, the initial equilibrium separation ratio depends on the absolute difference between the molecular weights of the isotopes and on the linear speed of rotation. The centrifuge's separative capacity is directly proportional to the length of the rotor and the fourth power of its linear speed of rotation. On the other hand, the speed is limited by allowable mechanical stresses in the structural materials of the centrifuge rotor. Increasing its length involves solving the complex technical problem of creating a supercritical rotor, one that rotates at a frequency exceeding the critical frequency of intrinsic bending vibrations. For these reasons, a single gas centrifuge cannot achieve the desired enrichment. However, a Soviet gas centrifuge enrichment cascade contains only ten to twelve successive stages, rather than the thousand or more stages required by gaseous diffusion. Each stage has a large number of parallel gas centrifuges.

The design of the Soviet gas centrifuge for uranium isotope separation includes six basic assemblies and elements:

- a vertical metal thin-walled cylindrical rotor reinforced with composite material;
- a magnetic mount that confines the rotor in the vertical position and prevents the top from vibrating relative to the rotor axis;
- a needle bearing and an oil dampener to absorb the energy of rotor vibrations, both during startup and during operation at rated speeds, despite various types of mechanical and hydraulic perturbations;
- a disk-type synchronous hysteresis motor running on three-phase AC;
- a steel housing for the centrifuge, which provides high vacuum during rotor rotation. The top of the housing includes molecular pumps in the form of fixed bushings with helical slots coaxial to the rotor, with a small gap. The surface of the housing is water-cooled;
- a gas distribution manifold fastened to the machine's top cover, through whose lines gas is supplied to the rotor and the light and heavy fractions are removed.

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Gas centrifuges require no special preventive maintenance throughout their entire service lives, and the machines' separation characteristics remain practically constant over time.

Commercialization of Gas Centrifuge Technology

The commercialization of Soviet gas centrifuge technology for uranium enrichment required the solving of a broad range of complex scientific and engineering problems in most diverse areas: metallurgy and materials science; mechanical engineering; ultrahigh-speed tubular rotor dynamics and strength mechanics; gas dynamics and the physics of separation processes; physical chemistry; and more. On October 4, 1957, again in Sverdlovsk province, the first Soviet pilot (demonstration) plant was commissioned; it contained 2,500 gas centrifuges. This plant tested both the first industrial-design centrifuges and the new support systems (electric power supply, monitoring, automation, and control) that had to be

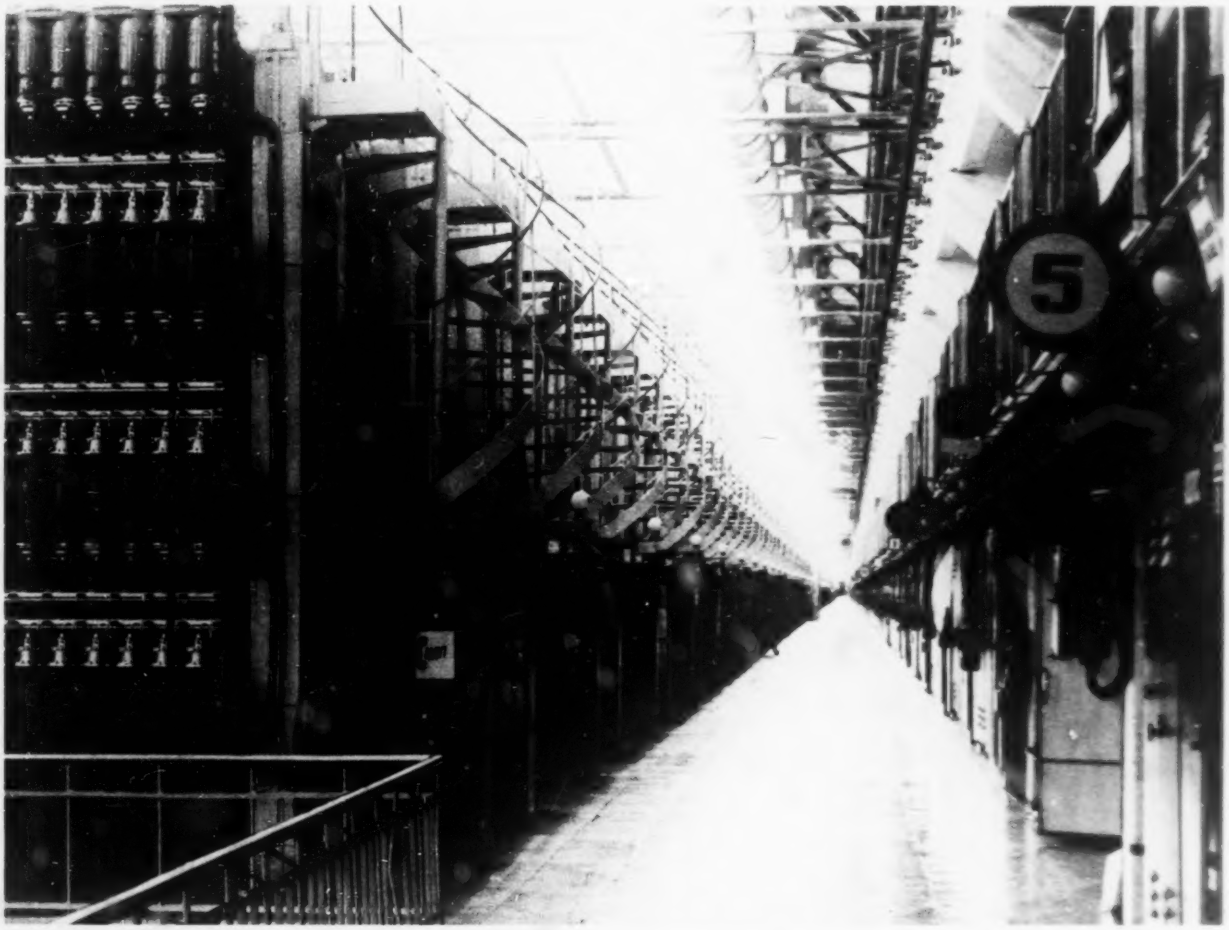

Figure 4 – Interior view (first of two; see also Figure 5) showing cascades at an operating gas centrifuge plant. *(Photo Courtesy of MAEI).*

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developed to make the process work. The pilot plant's first year of operation confirmed the reliability of centrifuges and their support systems, as well as the engineering and cost advantages of gas centrifuge technology compared to gaseous diffusion.

The first industrial gas centrifuge plant, containing several tens of thousands of centrifuges, was commissioned in 1959. It was used to test industrial centrifuge designs, as well as technological solutions adopted in the design of the industrial plant. Eventually, the USSR built an industrial plant with several hundred thousand subcritical centrifuges configured in three levels, and commissioned it in three stages (modules) in 1962-1964. The rotors of these centrifuges, which were made of aluminum alloy, needed almost no additional reinforcement, only small rings of reinforcing material in the area of the upper and lower covers of the rotor. The maximum number of centrifuges working in parallel in a stage at the first plant was 15,000. The configuration of machines in stages permitted faulty individual centrifuges to be replaced fairly simply. **Figure 4** and **Figure 5** show cascades at an operating gas centrifuge plant (location classified).

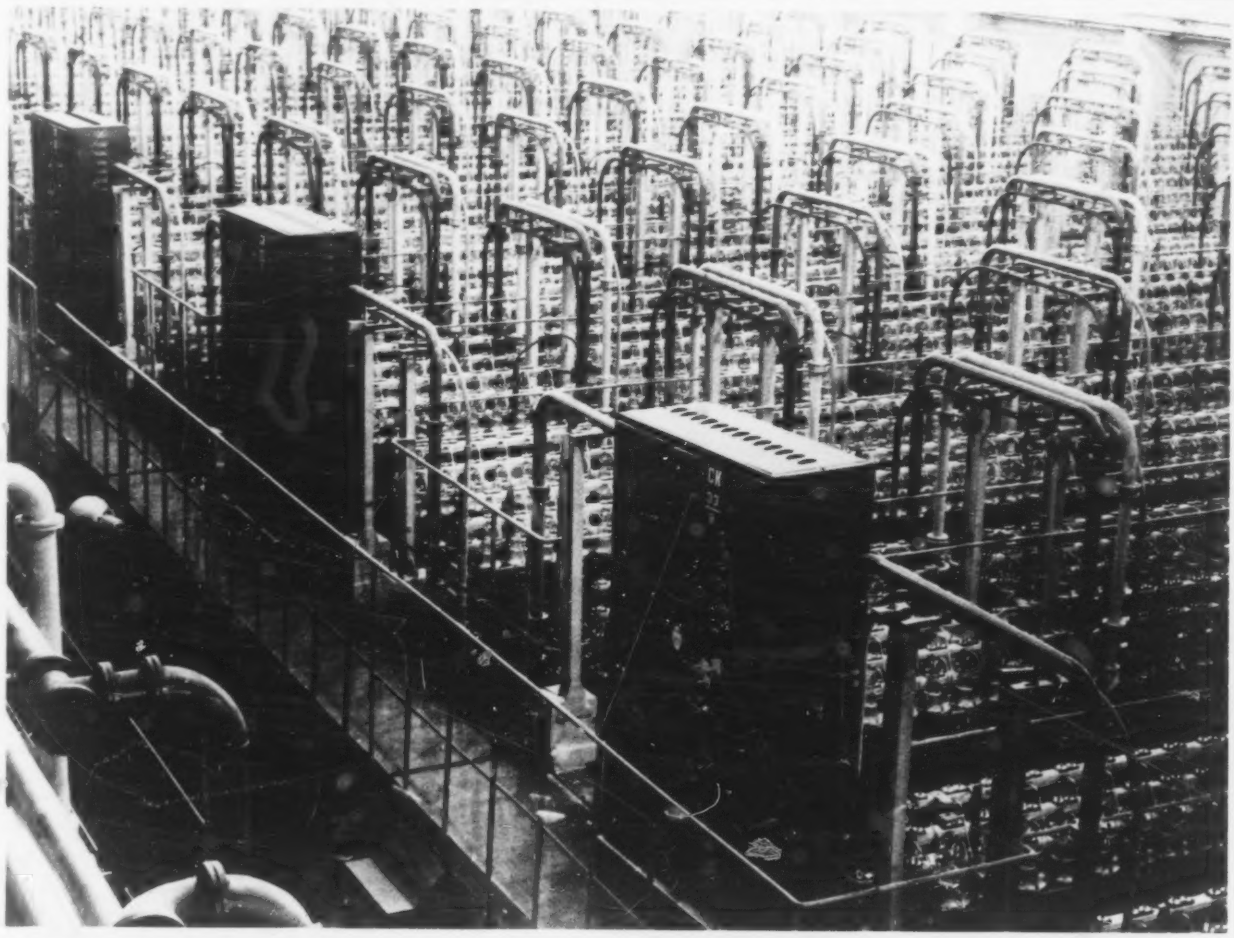

Figure 5 – Interior view (second of two; see also Figure 4) showing cascades at an operating gas centrifuge plant. *(Photo Courtesy of MAEI).*

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The axial circulation of gas in the rotor, as in subsequent centrifuge models, is accomplished through gas-dynamic braking of the UF_6 on a fixed separator (mechanical excitation). The first gas centrifuge designs installed at this plant ran for 10-12, years with a failure rate less than 1.5 percent per year, and were replaced by more productive and reliable models.

The stable operation and high productivity of a gas centrifuge cascade depends mainly on the reliable operation of the centrifuge itself, which, for all its apparent simplicity, is a very technically complex structure. So, from the first years of industrial use of centrifuge technology, strict feedback was set up between operations and manufacturing plants, drawing on the results of failure analysis of machines in the separating cascade to evaluate the effectiveness of gas centrifuge manufacturing technology.

The successful development of this system was a consequence of the development and introduction, as part of the technological process monitoring and control subsystem, of special devices that monitored the speed of each centrifuge's rotor at a rate of once per second and transmitted the address of each faulty machine to the operator's control panel. Modern designs improved substantially on the first gas centrifuges, both in productivity and in reliability. Existing centrifuges requiring 120-140 kW per SWU can operate non-stop for over 15 years with a failure level of only tenths of one percent per year. The increase in productivity achieved by increasing the velocity of rotation of the rotor is due to the application of materials with high specific strength, optimal use of mechanical property structure of the material, and improvement of the gas dynamic characteristics.

Gas centrifuge technology is also being used in the USSR for the separation of isotopes of other chemical elements. Industrial installations with gas centrifuges are supplying the demand for stable isotopes of iron, tungsten, xenon, sulphur, molybdenum and a number of other elements. Equipment has been developed for producing various radioactive isotopes such as ^{55}Fe and ^{55}Kr.

Conclusion

The Soviet Union began uranium enrichment in 1949 using the gaseous diffusion method to produce material for nuclear weapons. Soviet research on gas centrifuge enrichment technology initiated more than 40 years ago formed the basis for most of today's successful programs.

All production of highly-enriched weapons-grade uranium was completely halted in 1987. At present the Soviet Union is operating four enrichment plants, two of which also have facilities for conversion to UF_6. All four enrichment facilities have gas centrifuge units, and gaseous diffusion units contribute less than five percent of total SWU output.

The Soviet Union began selling enrichment services to West European customers in 1971, and deliveries to Western customers began in 1973. In the mid-1970s, V/O Techsnabexport concluded contracts with firms in almost all Western European countries. Many of these contracts extend through the year 2000, and some as far as 2010.

Because the rate of nuclear power additions was overestimated, and more recently as a reaction to the Chernobyl accident, substantial excess nuclear fuel cycle capacity has become available. More recently the cessation of all nuclear weapons uranium production has exacerbated the nuclear fuel cycle overcapacity situation, especially with respect to uranium enrichment. The Soviet Union at present makes available to the market three million SWU per year; that figure can grow to 10 million SWU per year by 1995 or 1996. That capacity can be put to several uses:

1. Separation of stable isotopes other than ^{235}U;
2. Export sales of SWU or enriched product;
3. Reenrichment of reprocessed uranium;
4. Enriching tails (depleted uranium) to the isotopic concentration of natural uranium (0.711 $^{w}/_{o}$ ^{235}U) or even higher.

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NUCLEAR INDUSTRY CALENDAR

1991

April 14-17
INFO '91 Conference (The Westin Hotel, Chicago, Illinois).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

April 14-18
Third International Conference on Nuclear Fuel Reprocessing & Waste Management (Sendai, Japan).
Sponsored by the Atomic Energy Society of Japan and the Japan Atomic Industrial Forum, and co-sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

April 21-24
International Topical Meeting on LWR Fuel Performance (Palais des Papes, Avignon, France).
Sponsored by the American Nuclear Society and the European Nuclear Society.
Contact: Fragema, BP3021, F69398 Lyon Cedex 03, France; Tel: (33) 74 72 8159; Fax: (33) 74 72 8760.

April 22-25
JAIF International Conference on Water Chemistry in Nuclear Power Plants (Fukui, Japan).
Contact: Japan Atomic Industrial Forum; 3-508-2411; or Fax: 3-508-2094.

May 2-3
Utility Nuclear Fuel Economics Group Meeting (Downtown Holiday Inn, Minneapolis, Minnesota).
Sponsored by Northern States Power.
Contact: David Austin; 612-330-7571.

May 8-10
Second International Conference on Transportation for the Nuclear Industry (Bournemouth, United Kingdom).
Co-Sponsored by the Institution of Nuclear Engineers, the European Nuclear Society, the American Nuclear Society, the Chartered Institute of Transport, and the Institution of Civil Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

May 12-14
World Nuclear Fuel Market Annual Meeting (Atlanta, Georgia).
Contact: Donna Cason, World Nuclear Fuel Market; 404-447-1144.

May 14-16
Annual Meeting on Nuclear Technology '91 (Hotel & Congress Center Maritim, Bonn, Germany).
Sponsored by the Kerntechnische Gesellschaft e.V. and the Deutsches Atomforum e.V.
Contact: INFORUM GmbH, Congress Office JK'91, Heussallee 10, D-5300 Bonn 1, or 0228/507 223.

June 2-6
American Nuclear Society Annual Meeting (Marriot Orlando World Center, Orlando, Florida).
Contact: ANS Meetings Department; 708-352-6611.

June 9-12
Nuclear Technology: Building Our Energy Future (Sheraton Cavalier Hotel, Saskatoon, Canada).
Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society.
Contact: Sylvie Caron, CNA; 416-977-6152; or Fax: 416-979-8356.

June 23-26
International Conference on Enrichment (The Westin Hotel, Washington, DC).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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1991

Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES, 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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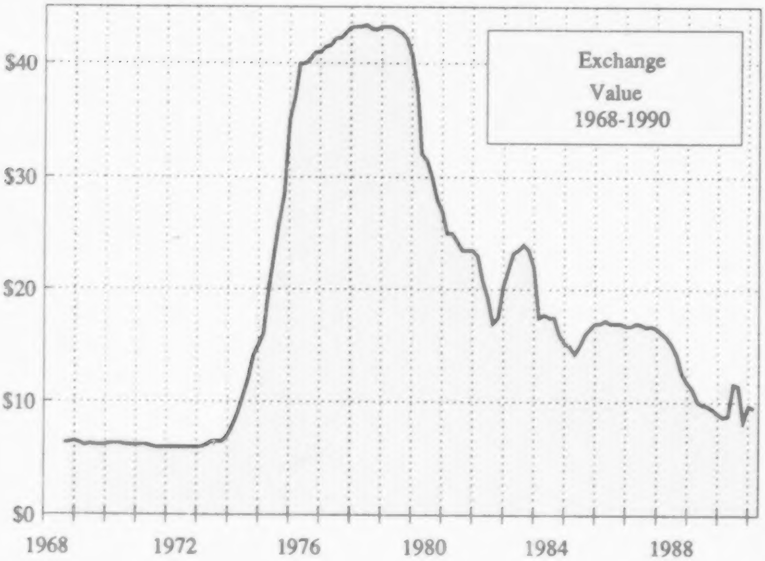
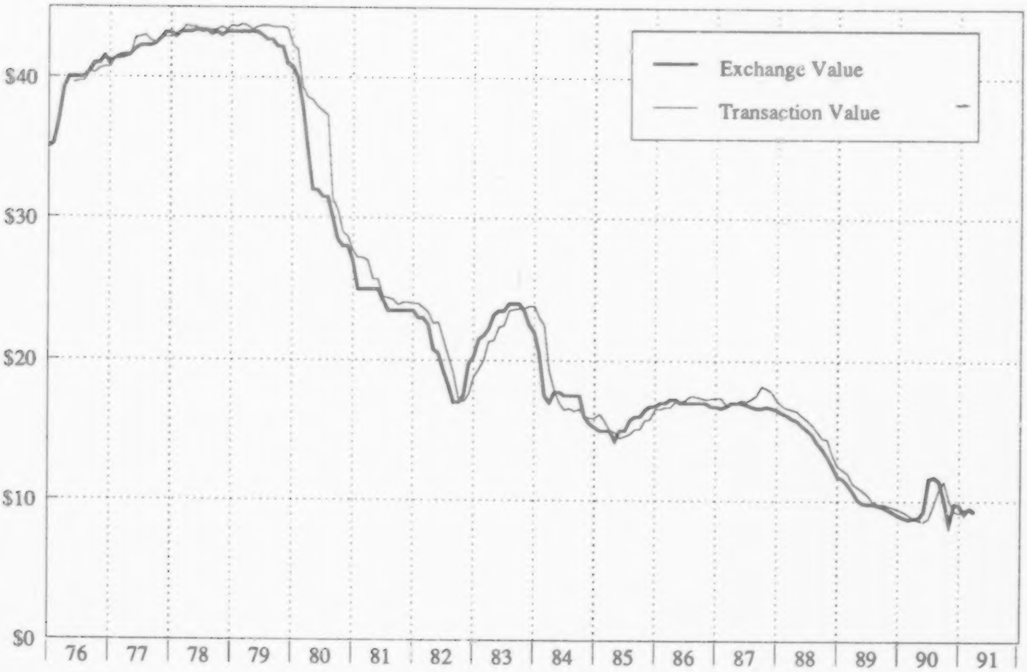
NUEXCO Historical Exchange Value and Transaction Value
(in US dollars per Pound U_3O_8)





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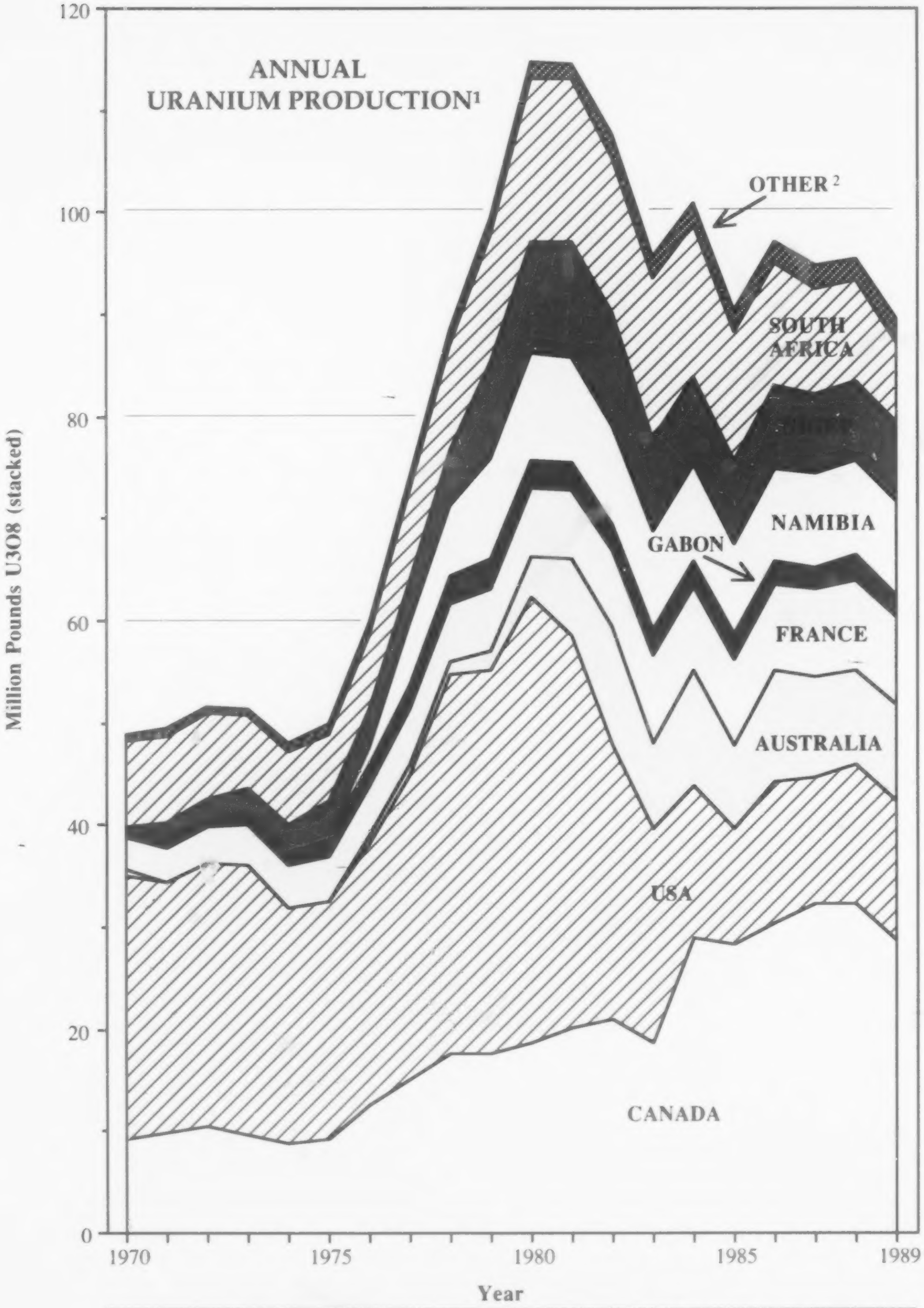

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, (West) Germany, and Yugoslavia

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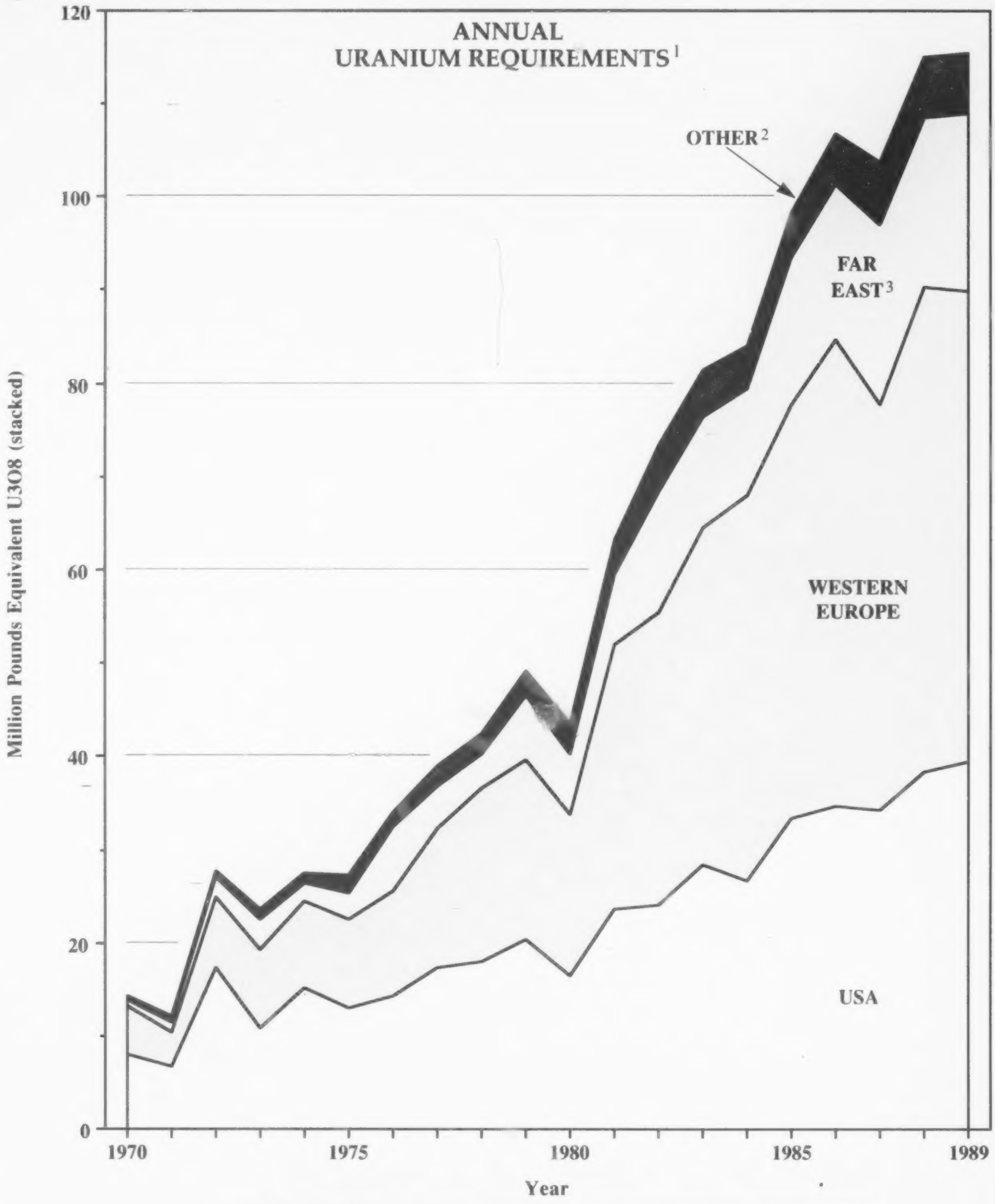

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	**9.30**									

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF$_6$ Values

Determined as of the last day of the month indicated ($US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	**27.50**									

US Premium (Relative to the UF$_6$ Value)

Determined as of the last day of the month indicated ($US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	**1.45**									

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	**9.35**									

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	**52**									

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	**3.50**									

* Float with Prime Rate

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	—	129.3
Jan	1990	—	119.2	—	128.3 **R**
Feb	1990	—	120.8	555.80	128.3 **R**
Mar	1990	204.1	121.5	—	128.5 **R**
Apr	1990	—	119.9	—	128.7 **R**
May	1990	—	118.9	566.60	128.9 **R**
June	1990	207.4	116.6	—	129.5 **R**
July	1990	—	116.4	—	129.6 **R**
Aug	1990	—	122.4	574.10	129.7 **R**
Sept	1990	208.9	128.2	—	130.1 **R**
Oct	1990	—	134.1	—	130.1 **R**
Nov	1990	214.5	133.7	—	130.1 **R**
Dec	1990	—	128.8	—	130.2 **R**
Jan	1991	—	—	—	130.1

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).
[6] Base: June 1976 = 100.

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Canada

		Industrial Products Price Index: All Commodities [1] (1986 = 100) [2]	Consumer Price Index: All Items (1986 = 100) [3]	Wage-earner Data: Average Hourly Earnings (C$) [4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	-.-	-.-	-.-	-.-	-.-
1981	Avg.	83.4	75.5	-.-	-.-	-.-	-.-	-.-
1982	Avg.	89.0	83.7	-.-	-.-	-.-	-.-	-.-
1983	Avg.	92.1	88.5	17.22	-.-	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	-.-	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3 **R**	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.7 **R**	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	111.0 **R**	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0 **R**	121.8	23.90 **R**	21.89 **R**	19.88 **R**	14.73 **R**	16.01 **R**
Jan	1991	111.1 **R**	125.0	23.06 **P**	21.57 **P**	19.71 **P**	14.66 **P**	15.84 **P**
Feb	1991	110.8	125.0	-.-	-.-	-.-	-.-	-.-

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	—	—
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	—	—
Jan	1991	—	—	219.5	218.0	—	—
Feb	1991	—	—	222.2	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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GOVERNMENT STATISTICS

United States

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10**R**	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.7	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4**R**	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.6	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	118.9	118.6	133.8	133.1	14.39**R**	14.69**R**	13.75	10.57
Jan	1991	118.3	118.9	134.6	—	14.65**P**	14.67**P**	13.83**R**	10.60**R**
Feb	1991	117.2	117.2	134.8	—	-.-	-.-	13.78**P**	10.58**P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration[1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers[2] (million pounds U_3O_8)	Average Price of Delivered Uranium[2] (\$/lb. U_3O_8)	Quantity of Uranium Imported[3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1989: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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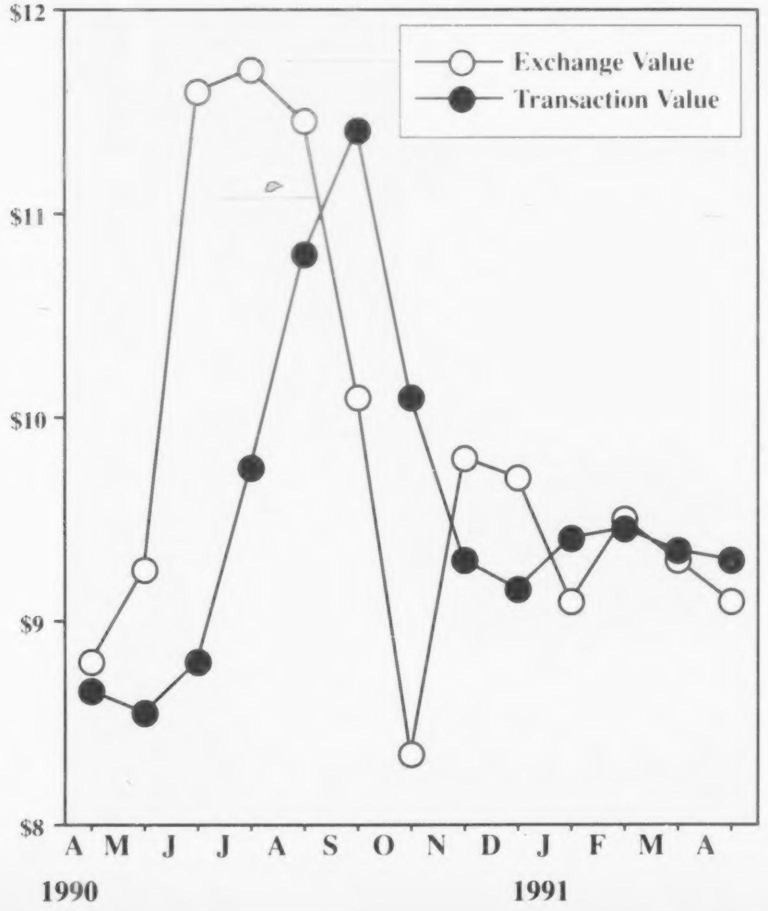

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The Soviet Union is a country of vast sources of energy including oil, natural gas, coal, uranium, and hydropower. In spite of this wealth of resources, the Soviet Union has difficulty meeting its demand for energy. This article analyzes the energy situation in the Soviet Union and gives its outlook for the future.

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- Jabiluka Uranium Project

The Jabiluka gold and uranium deposit in the Northern Territory of Australia is the world's largest known primary uranium deposit. Once developed, Jabiluka's planned capacity would be 3.3 million pounds U_3O_8 per year. If the Australian government continues its recent moves toward progressive and flexible uranium policies, Jabiluka could take its place among the first rank of world uranium producers.

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To Our Readers

NUEXCO would like to draw your attention to two changes in the Monthly Report:

First, please note that the telephone and fax numbers of our Hong Kong office have changed. The new numbers are given here and are regularly listed on the inside front cover of each Report.

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Secondly, please note that we have changed slightly the way we calculate the Market Values Expressed in Selected Currencies. We now calculate the values using the currency exchange rates *for* the last business day of the month as published in the Wall Street Journal. Previously, the values were calculated using the currency exchange rates *published on* the last business day of the month.

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May 1991
No. 273

MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report April 30, 1991	Last Report March 31, 1991	12 Months Ago April 30, 1990
EXCHANGE VALUE[1]	**\$9.10**/lb equivalent U_3O_8	\$9.30	\$8.80
UF_6 VALUE[2]	**\$27.25**/kg U as UF_6	\$27.50	\$24.40
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.45**/lb U as UF_6	\$1.45	\$1.45
SWU VALUE[5] (0.3 $^{w}/_{o}$ tails assay)	**\$52**/SWU	\$52	\$50
TRANSACTION VALUE[6]	**\$9.30**/lb equivalent U_3O_8	\$9.35	\$8.65
Transactions	**22**	19	24
Months	**3**	3	3
Millions of Pounds	**5.6**	3.0	8.4

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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APRIL MARKET REVIEW

(as of April 30, 1991)

OVERVIEW

The uranium market softened somewhat during April, reaching a bottom near mid-month and strengthening slightly by month end. The Exchange Value fell $0.20, to $9.10 per pound U_3O_8, and the UF_6 Value also fell, declining to $27.25 per kgU as UF_6. Nine near-term uranium sales were reported, totalling almost 4 million pounds equivalent U_3O_8 in five concentrates, three UF_6, and one enriched uranium product (EUP) sales (**Table 1**).

Uranium sales volume increased significantly during April, particularly during the third week of the month. The 3.8 million pounds equivalent U_3O_8 that were sold during April is the highest monthly sales volume thus far in 1991, outdistancing January, February, and March's volume of 1.0, 1.8, and 2.2 million pounds, respectively. This increase in volume is normal for the second quarter, traditionally the busiest quarter of the year. Although 1991 year-to-date sales volume has reached 8.8 million pounds equivalent U_3O_8, it is lagging well behind last year's record volume of 13.9 million pounds for the same time period. The lack of discretionary buyers, particularly producers, in the market may be the chief reason for the lower volume thus far.

The Loan Rate remained unchanged at 3.5 percent per annum. Only one loan for a small quantity of concentrates is reported. The Conversion Value was also unchanged at $1.45 per pound U as UF_6. Two conversion sales for moderate quantities are reported.

The SWU Value remained at $52 per SWU. Four near- and intermediate-term sales were concluded, totalling over 250 thousand SWU.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	April 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	5	1.2	19	3.4
Natural UF_6	3	2.4	9	3.3
EUP	1	0.2	8	2.1
Total[2]	**9**	**3.8**	**36**	**8.8**

[1] million pounds equivalent U_3O_8
[2] columns may not total due to independent rounding

NATURAL URANIUM AND CONVERSION

The **Exchange Value** declined by $0.20 (2%) on April 30, to **$9.10** per pound U_3O_8. The market continued its downward trend early in April, reaching a bottom near mid-month. Most of the month's activity also occurred at that point, leading to an increase in offer prices. Unlike past months when most demand was discretionary, demand in April primarily was a result of buyers seeking to fill specific needs. Nearly all of the active demand came from North American buyers, with demand in Europe very low. As the market firmed near the end of the month, prices did not begin to strengthen as they did last year. Market participants see little significant upward pressure on prices, and many buyers and sellers believe prices will not change significantly in the upcoming months.

Of the nine near-term uranium sales, five involved concentrates totalling over 1.2 million pounds equivalent U_3O_8. US intermediaries sold most of the material to other US entities at prices near the April 30, 1991 Exchange Value.

* * *

The UF_6 market also weakened during April. By month-end, the **UF_6 Value** slipped $0.25 (1%), to **$27.25** per kgU as UF_6. Due mostly to one large inventory purchase, utilities purchased over 2.3 million pounds equivalent U_3O_8 in three near-term natural UF_6 transactions. All three sales took place at prices at or near the April 30 UF_6 Value.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	6,085	1,455
• Supply/Demand Ratio:	4.2	
• Loan (thousand lbs equivalent U_3O_8)	6,900	,940
• Conversion (thousand lbs U as UF_6)	700	350
• SWU (thousand SWUs)	425	105

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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In the long-term market, utilities purchased nearly four million pounds equivalent U_3O_8 in five transactions. The contracts call for delivery during the period 1991 to 1998, and utilize fixed price and market-related pricing mechanisms. Five utilities continued to evaluate long-term uranium offers at month end.

* * *

The **Transaction Value** dropped $0.05, to **$9.30** per pound U_3O_8 based on 22 transactions over 3 months involving 5.6 million pounds equivalent U_3O_8, with April's lower-priced sales responsible for the decline.

* * *

Historically, demand increases during the second quarter of a year. This year was no exception; firm demand increased during the month, but emerging supply more than filled the new demand. So at the end of the month, **active uranium demand** equalled only **1.5** million pounds equivalent U_3O_8, whereas **active uranium supply** grew slightly, increasing to **6.1** million pounds equivalent U_3O_8 (**Table 2**). The **supply-demand ratio** became **4.2**.

* * *

The **Loan Rate** was unchanged at **3.5** percent per annum. Only one loan was reported, in which a US utility lent a small quantity of concentrates to an intermediary near the prevailing Loan Rate.

* * *

The **Conversion Value** was also unchanged, remaining at **$1.45** per pound U as UF_6. Two conversion sales were reported from April totalling nearly 400 thousand pounds U. Intermediaries sold the material to a utility and another intermediary at prices near the April 30 Conversion Value for delivery later this year. Available supply of low-priced conversion appears to be thinning, but the current lack of demand for spot conversion prevents any substantial recovery in this market.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** remained at **$52** per SWU. Four near- and intermediate-term enrichment sales were reported for a total exceeding 250 thousand SWU. Utilities made all four purchases at levels near the April 30 SWU Value. One of the sales involved a small quantity of SWU contained in EUP. The SWU market remained active during April, and at least nine utilities were still evaluating near- and long-term SWU offers at the end of the month.

Table 3
ENRICHMENT PRICES
(April 30, 1991)

Prices	This Month Report 273	Last Month Report 272	12 Months Ago Report 261
NUEXCO SWU Value (\$US per SWU)	52	52	50
US DOE SWU prices: (\$US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)[4]	100.60[4]	100.60[4]	90.00[5]
Calculated worth of enriched UF_6[6]: (\$US per KgU as UF_6)			
2.0 w/o U_{235}	200	202	193
2.5 w/o U_{235}	276	279	267
3.0 w/o U_{235}	355	359	343
3.5 w/o U_{235}	436	440	421
4.0 w/o U_{235}	517	522	500
4.5 w/o U_{235}	600	605	579

[1] Effective 10/1/89 to 9/30/91.
[2] Effective 10/1/87 to 9/30/89.
[3] Effective since 10/1/84.
[4] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[5] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5086	1991	301-600	103-110	Intermediary	Intermediary	
5087	1995-1996	301-600	R	Utility	Intermediary	
5089	1992-1996	601-1,000	See Remarks	Utility	R	Price Related to Market
5090	1995-1998	601-1,000	See Remarks	Utility	R	Series of Fixed Prices
5091	1991-1992	1,001-3,000	98-102	Utility	Intermediary	UF_6
5092	1991	101-300	98-102	Utility	Intermediary	
5096	1991	101-300	98-102	Convertor	Intermediary	
5097	1991	101-300	98-102	Producer	Intermediary	
5099	1991	301-600	98-102	Utility	R	UF_6
5100A	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5104	1991-1997	1,001-3,000	See Remarks	Utility	Producer	Price Related to to Market
5105	1992-1994	601-1,000	See Remarks	Utility	Producer	Price Related to to Market
5106	1991	50-100	98-102	Utility	R	
5107	1991	50-100	98-102	Utility	Intermediary	UF_6

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5103	1991	50-100	98-102	Intermediary	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5101	1991	101-300	90-97	Intermediary	Intermediary	
5102	1991	101-300	90-97	Utility	Intermediary	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5084	1991	50-100	98-102	Utility	Intermediary	
5085	1991	Less Than 50	98-102	Utility	Intermediary	
5098	1992-1995	101-300	See Remarks	Utility	Intermediary	Base Price Escalated
5100B	1992	Less Than 50	See Remarks	Utility	Intermediary	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Quantity (Thousand Pounds equivalent U_3O_8) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A	700	1,045 per year	1991-1993	UF_6e
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1501	3,000	1,000 per year	1991-1995	U_3O_8/UF_6
91-1060	100	—	1991	
91-1502	500	—	1991	
91-1504*	785	—	1991	UF_6
Total	**6,085**			
INACTIVE	**5,430**			
AVAILABLE FOR LOAN:				
ACTIVE				
90-1016	1,000	—		U_3O_8
90-1230	1,000	—		U_3O_8
91-1034	1,000	—		U_3O_8
91-1084	3,900	—		U_3O_8
Total	**6,900**			
INACTIVE	**1,500**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1018
Active Projects removed since last month: 90-1260, 90-1275

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100A	45	—	1991	UF_{6e}
90-1224A*	300	11,700	1991-2001	U_3O_8/UF_6/UF_{6e}
91-1010A	85	—	1991	UF_{6e}
91-1101*	25	—	1991	
91-1102*	1,000	1,000 per year	1991-1995	U_3O_8/UF_6
90-1291	—	100 per year	1991-1995	
91-1014A	—	6,800	1992-2001	UF_{6e}
91-1017	—	300 per year	1995-2000	
91-1054	—	1,200	1992-1997	
91-1064*	—	230 per year	1993-1997	U_3O_8/UF_6
91-1093*	—	200 per year	1994-1996	
91-1094A*	—	1,700 per year	1994-1995	UF_{6e}
Total	**1,455**			
INACTIVE	**3,690**			
INQUIRIES TO BORROW:				
ACTIVE				
91-1100*	940	—		UF_6
Total	**940**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1045, 91-1075, 91-1080A
Active Projects removed since last month: 90-1289, 91-1038, 91-1040, 91-1067, 91-1071A, 91-1073, 91-1074,

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6)		Delivery Period	Remarks
	Within 3 Years[1]	Beyond 3 Years[1]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	300	—	1991	
91-1501	400	—	1991	
Total	**700**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1085*	350	3,000	1993-1998	
Total	**350**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1077

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078B	200	435 per year	1991-1993	UF_6e
91-1008	75	—	1991	
91-1032	150	—	1991	
90-1500	—	1,000	1991 on	
Total	**425**			
INACTIVE	**815**			
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100B	15	—	1991	UF_6e
90-1224B*	40	1,920	1991-2001	UF_6e
91-1010B	20	—	1991	UF_6e
91-1069	30	—	1991	
90-1181	—	1,500	1996-2001	
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	UF_6e
91-1014B	—	1,770	1992-2001	UF_6e
91-1027	—	55 per year	1996-2000	
91-1028	—	125	1995-1996	
91-1055	—	180	1992	UF_6e
91-1063	—	15 per year	1995-1998	
91-1066	—	320	1995-2000	
91-1083	—	150 per year	1996-1998	
91-1094B*	—	385 per year	1994-1995	UF_6e
Total	**105**			
INACTIVE	**170**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 88-1006, 91-1080B

Active Projects removed since last month: 90-1094, 91-1023, 91-1071B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)
Australia (dollar)	11.64	12.00	11.69	30.25	31.20	30.40
Belgium (franc)	319.07	326.43	304.50	829.52	848.65	791.63
Canada (dollar)	10.49	10.77	10.24	27.28	28.01	26.62
EC (ecu)	7.65	7.75	7.24	19.89	20.15	18.82
Finland (markka)	36.30	37.48	34.82	94.36	97.45	90.53
France (franc)	52.52	53.68	49.49	136.54	139.56	128.67
Germany (mark)	15.55	15.86	14.77	40.42	41.24	38.39
Italy (lira)	11,480	11,805	10,815	29,845	30,690	28,116
Japan (yen)	1,239	1,314	1,402	3,222	3,415	3,645
Netherlands (guilder)	17.49	17.88	16.59	45.46	46.48	43.13
So. Africa (comm. rand)	25.36	25.40	23.39	65.92	66.04	60.80
So. Korea (won)	6,604	6,749	6,178	17,170	17,547	16,060
Spain (peseta)	957.29	983.09	933.29	2,489	2,556	2,426
Sweden (krona)	55.73	57.27	53.56	144.87	148.88	139.25
Switzerland (franc)	13.13	13.52	12.80	34.13	35.15	33.29
Taiwan (dollar)	244.79	250.36	231.44	636.39	650.87	601.69
UK (pound)	5.26	5.34	5.38	13.67	13.89	13.99
US (dollar)	9.10	9.30	8.80	23.66	24.18	22.88

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)
Australia (dollar)	11.89	12.06	11.50	30.92	31.37	29.88
Belgium (franc)	326.09	328.19	299.31	847.75	853.21	778.13
Canada (dollar)	10.72	10.83	10.06	27.88	28.16	26.16
EC (ecu)	7.82	7.79	7.11	20.32	20.25	18.50
Finland (markka)	37.09	37.68	34.23	96.43	97.97	88.98
France (franc)	53.67	53.97	48.65	139.54	140.31	126.47
Germany (mark)	15.89	15.95	14.52	41.31	41.46	37.74
Italy (lira)	11,732	11,868	10,630	30,501	30,855	27,637
Japan (yen)	1,267	1,321	1,378	3,293	3,433	3,583
Netherlands (guilder)	17.87	17.97	16.31	46.46	46.73	42.39
So. Africa (comm. rand)	25.91	25.54	22.99	67.37	66.40	59.76
So. Korea (won)	6,749	6,786	6,072	17,547	17,641	15,787
Spain (peseta)	978.33	988.37	917.38	2,543	2,570	2,385
Sweden (krona)	56.95	57.57	52.65	148.06	149.68	136.87
Switzerland (franc)	13.42	13.59	12.59	34.88	35.34	32.72
Taiwan (dollar)	250.17	251.70	227.49	650.38	654.37	591.43
UK (pound)	5.37	5.37	5.29	13.97	13.97	13.75
US (dollar)	9.30	9.35	8.65	24.18	24.31	22.49

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[1] Calculated using currency exchange rates published in *The Wall Street Journal* for the last business day of the month..

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6			per kg U as UF_6		
	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)
Australia (dollar)	1.85	1.87	1.93	4.09	4.12	4.25
Belgium (franc)	50.84	50.90	50.17	112.09	112.20	110.61
Canada (dollar)	1.67	1.68	1.69	3.69	3.70	3.72
EC (ecu)	1.22	1.21	1.19	2.69	2.66	2.63
Finland (markka)	5.78	5.84	5.74	12.75	12.88	12.65
France (franc)	8.37	8.37	8.15	18.45	18.45	17.98
Germany (mark)	2.48	2.47	2.43	5.46	5.45	5.36
Italy (lira)	1,829	1,841	1,782	4,033	4,058	3,929
Japan (yen)	197.49	204.80	231.00	435.40	451.51	509.27
Netherlands (guilder)	2.79	2.79	2.73	6.14	6.15	6.03
So. Africa (comm. rand)	4.04	3.96	3.85	8.91	8.73	8.50
So. Korea (won)	1,052	1,052	1,018	2,320	2,320	2,244
Spain (peseta)	152.54	153.28	153.78	336.28	337.92	339.03
Sweden (krona)	8.88	8.93	8.83	19.58	19.68	19.46
Switzerland (franc)	2.09	2.11	2.11	4.61	4.65	4.65
Taiwan (dollar)	39.00	39.03	38.13	85.99	86.06	84.07
UK (pound)	0.84	0.83	0.89	1.85	1.84	1.95
US (dollar)	1.45	1.45	1.45	3.20	3.20	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
	This Month (Apr. 30, 1991)	Last Month (Mar. 31, 1991)	12 Months Ago (Apr. 30, 1990)	This Month (Apr. 30, 199	Last Month (Mar. 31 1991)	12 Months Ago (Apr. 30, 1990)
Australia (dollar)	66.50	67.10	66.45	34.85	35.48	32.43
Belgium (franc)	1,823	1,825	1,730	955.47	965.25	844.29
Canada (dollar)	59.96	60.24	58.17	31.42	31.86	28.39
EC (ecu)	43.71	43.33	41.13	22.91	22.91	20.07
Finland (markka)	207.40	209.58	197.85	108.69	110.84	96.55
France (franc)	300.11	300.16	281.20	157.27	158.74	137.23
Germany (mark)	88.84	88.69	83.91	46.56	46.90	40.95
Italy (lira)	65,599	66,007	61,448	34,376	34,907	29,986
Japan (yen)	7,083	7,345	7,966	3,712	3,884	3,887
Netherlands (guilder)	99.92	99.96	94.25	52.36	52.86	45.99
So. Africa (comm. rand)	144.89	142.04	132.87	75.93	75.12	64.84
So. Korea (won)	37,739	37,739	35,100	19,776	19,958	17,129
Spain (peseta)	5,470	5,497	5,303	2,867	2,907	2,588
Sweden (krona)	318.43	320.20	304.32	166.87	169.33	148.51
Switzerland (franc)	75.01	75.60	72.75	39.31	39.98	35.50
Taiwan (dollar)	1,399	1,400	1,315	733.02	740.30	641.72
UK (pound)	30.04	29.88	30.57	15.74	15.80	14.92
US (dollar)	52.00	52.00	50.00	27.25	27.50	24.40

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[1] Calculated using currency exchange rates published in *The Wall Street Journal* for the last business day of the month.

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RECENT DEVELOPMENTS

Canada

On April 18, the Canadian Federal Environment Minister, Robert de Cotret, and the province of Saskatchewan's Environment and Public Safety Minister, Grant Hodgins, announced the formation of a new joint-review panel, to "review the proposed uranium mine developments in Northern Saskatchewan, and assess their acceptability." The review panel will "...focus on the environmental, health, safety, and socio-economic impacts of the proposed developments," and then report to the appropriate Ministers. The joint review will displace the separate, and sometimes redundant, reviews by the federal government and the provincial government.

The review panel will consist of four to seven members; the selection process for the members is currently underway. The panel will invite public comment and hold public hearings on issues regarding specific mine developments, as well as issues regarding guidelines for future submittals by developers to the committee.

Once the panel member selection is completed, the panel will have eighteen months to complete its final report on each of the proposals for the three proposed developments for which an Environmental Impact Statement (EIS) has already been submitted. These three proposed developments are Amok Ltd.'s Dominique-Janine Extension (of the Cluff Lake Project), Midwest Joint Venture's South McMahon Lake Project, and Minatco Ltd.'s Wolly (McClean Lake) Project.

For the two proposed developments that have yet to submit an EIS (the McArthur River Joint Venture's McArthur River Project and the Cigar Lake Mining Corporation's Cigar Lake Project), the review panel will solicit and review public comment, and then issue guidelines for EIS submittal to the developer of each project. Once the panel has received the EIS, the panel must respond with its final report in ten months. However, no deadline for guideline preparation was included in the initial press release.

Cameco's Eagle Point Project received it environmental approval in 1988 and is currently in test mine development. While this project is not mentioned as one of the projects the panel will review, it is possible that any expansion beyond the test mining stage will require the panel's review before a commercial-production permit is considered.

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WASHINGTON FOCUS

by Linda L. Gunter

As Spring blossoms in Washington, so have legislative initiatives on national energy policy. The Senate Energy & Natural Resources Committee held more than 15 hearings, and then began to markup Sen. J. Bennett Johnston's (D-LA) omnibus energy bill (S 341). Included in that markup was S 210, Sen. Wendell Ford's (D-KY) uranium enrichment restructuring bill. The House also considered energy policy legislation, and two committees held hearings on enrichment issues. Sen. Malcolm Wallop (R-WY), in an April 15 speech to the Johns Hopkins University International Energy Program, called on President Bush to lead Congress to establish a national energy strategy. Wallop said Congress alone cannot convince the American public to build new nuclear reactors or allow exploration of the Arctic National Wildlife Refuge: that there must "be a forceful Presidential presence...". On April 1, US utilities sent DOE notices terminating all or a portion of their USEC for the years 1996, 2000, and 2001. The NRC and FEMA have published their proposed user fees for licensing nuclear facilities. President Bush announced his plan to nominate Ivan Selin, currently with the State Department, to replace Kenneth Carr as NRC Chairman, when Carr's term expires in June. Both the House of Representatives and the Senate have passed Budget Resolutions that reflect small changes in overall spending authority for FY 1992. Thus, the appropriation committees will hold hearings within the next two months to allocate funds for specific programs.

USEC Termination Notices

◇ Whereas last year DOE postponed the 10-year notices on enrichment contracts for utilities, this year, notification on both 5-year (1996) and 10-year (2000 and 2001) notices were required on April 1. While most utilities remained committed to taking 70 percent of their requirements from DOE in 1996, 30 US utilities opted to terminate 100 percent of their requirements in 2000, and 31 utilities terminated 100 percent for 2001. Of those utilities which stayed with DOE in 2000 and 2001, the majority reduced their commitments to 70 percent or less.

Uranium Enrichment Restructuring Hearing

◇ On April 10, the Energy & Power Subcommittee held a hearing on all bills introduced in the House regarding restructuring DOE's uranium enrichment program. Three panels of witnesses—one Congressional, one from the administration, and one from the private sector—called on the House to consider the problems of the program and options for resolving them. DOE Assistant Secretary for Nuclear Energy, Bill Young, announced that DOE has written a new enrichment restructuring bill that will be sent to Congress as soon as it receives OMB clearance. DOE will ask for a revolving fund to allow the program to retain profits from one fiscal year to the next, rather than returning money to the Treasury. Committee members expressed dissatisfaction that unresolved issues still include funding for decommissioning and decontamination (D&D) of the gaseous diffusion plants (GDP) and environmental cleanup, the consequences of a corporate default on its bonds, and the uncertain status of the atomic vapor laser isotope separation (AVLIS) program. The members expressed concern about the effect of these factors on DOE's long-term competitiveness.

DOE was criticized for its decision not to fund any deployment activities beyond this year. The General Accounting Office (GAO) testified on the AVLIS program and concluded that DOE will not have completed enough of the demonstration program to arrive at an accurate estimate of the deployment cost by the end of 1992, the original target date. The GAO urged DOE to continue with some predeployment activities, even though most were terminated because of DOE's decision to request no money for FY 1992. In particular, continuation of NRC licensing for AVLIS and an accurate assessment of the scope and costs for D&D are crucial prior to privatization of the program. Nick Timbers, Managing Director of Smith Barney, testified that Congress should increase the proposed amount of

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borrowing authority from $2.5 billion to $6 billion in order to remain on schedule for AVLIS deployment and to maintain the GDPs.

Rep. Michael Synar (D-OK), who chaired the hearing for Rep. Sharp, concluded the hearing by saying the program is in serious difficulty. He believes something should be done, but also expressed skepticism that any of the solutions presented during the hearing were sufficient to fix the program. But as Sen. Ford said in his testimony, "we cannot just close the books and walk away from the enrichment plants..." because of D&D and the need for environmental cleanup funds. Sen. Ford claimed that the Senate will pass his bill again, and that he looks forward to working with House members to arrive at a compromise on the issue this year.

Enrichment Restructuring Bill Markup

◇ On April 23, the Senate Energy & Natural Resources Committee, as part of its markup of S 341, the Comprehensive National Security Energy Act, took up Sen. Ford's uranium enrichment restructuring bill (S 210). The bill was marked up as Title XIV of S 341, and also as a stand alone bill, thus allowing Sen. Ford to bring S 210 to the Senate floor for a vote as soon as the committee has reported the bill (which will occur in May). Aside from some technical amendments which are not substantial, an amendment from Sen. Wallop was included by unanimous consent. The Wallop amendment requires the International Trade Commission (ITC) to investigate the exports of uranium and enriched uranium from non-market economies, and to determine whether prices of this material are below the cost of production. The ITC must report its findings to the President and to Congress within one year. The amendment also requires utilities to report on the origin and seller of any uranium imported by the utility. Finally, DOE is authorized to purchase enriched uranium as long as the price paid is below its costs of production. If enriched uranium is purchased, any feed supplied by DOE's customers may be used by DOE only for inventory or overfeeding.

User Fees

◇ As part of the FY 1992 budget proceedings, both the Federal Emergency Management Agency (FEMA) and the NRC will issue rules on user fees. On April 8, the FEMA rule became effective, requiring nuclear plant licensees to pay for its services. The fees are for personnel and contractor services directly related to obtaining and maintaining an operating license, such as emergency plan review. On April 12, the NRC issued its proposed rule to collect its FY 1992 operating budget via user fees. For reactor licensees, the fees will increase from about $1 million per year to about $2.6 million per year. In order to allocate the costs among all categories of applicants, several changes to past procedures are proposed. The NRC plans to establish fees for export and import license applications that have been previously exempted. The export license fees are expected to range from $1,300 to $7,000 depending on the material or equipment exported and type of action required. For costs not attributable to power reactors, the NRC will establish annual fees for fuel cycle and materials licensees. For converters and fabricators, the annual fee per facility is expected to range between $300,000 and $2.3 million, depending upon the type of license. Transportation fees also will be collected through issuance of a certificate of compliance for approved casks, packages, and shipping containers. Fees range between $11,000 and $71,500 per year for these certificates. The annual fee for quality assurance program approval is $500 for each "use only" approval and $9,100 for each "use and fabrication" approval.

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While the NRC has attempted a fair allocation of costs according to its determination of the party most benefitted, some regulatory activities are more difficult to categorize. According to the proposed rule, if the Commission decides not to recover the costs of export licensing under *CFR Part 170*, then the NRC will recover these costs with an additional assessment to operators of power reactors. Generic uranium activities which the NRC cannot attribute to any category, such as international cooperation on safeguards, non-proliferation work, and establishment of the regulatory framework for enrichment facilities, are allocated to power reactor licensees. However, once the NRC issues a uranium enrichment facility license, the Commission will reconsider the assessment of generic costs to those licensed facilities. Other costs, such as NRC review of DOE's work at West Valley and cleanup of old uranium mill tailings sites under the Uranium Mill Tailings Radiation Control Act (UMTRA), also would be collected from reactor operators. Industry has until May 13 to submit comments on the proposed rule.

AVLIS Budget Hearing

◇ The House Energy R&D subcommittee convened a hearing on April 10 to consider DOE's AVLIS program budget. During the hearing, DOE was forced to defend its decision to defer deployment spending until a government corporation is created. Testimony from Lawrence Livermore National Laboratory and Martin Marietta indicate the research and development program is successful and on schedule. Although an integrated test of the laser and separator systems is scheduled for December 1991, the demonstration facility will not necessarily be identical to the production facility, allowing inclusion of further technological improvements, primarily in the laser. Lawrence Livermore testified that the demonstration design should prove what is necessary for a full scale plant. This testimony was questioned by Chairman Marilyn Lloyd, the GAO, and the industry witness, Mr. Gene Miles of Westinghouse.

All the witnesses felt DOE should reconsider its decision not to continue the request for quotation for a commercial deployment contractor. Lawrence Livermore asked Congress to add $25 million to the FY 1992 budget for essential predeployment activities. Mr. Miles testified that private sector expertise is essential to demonstrate AVLIS technology. He noted widespread industry concern that the selection of metal, rather than gas, for the feed and product will be a critical factor in AVLIS's integration into the fuel cycle, and a private company's input on those costs is essential.

DOE announced the only predeployment activities it will continue in FY 1991 are those activities related to site selection. DOE Assistant Secretary Bill Young announced that DOE has selected three sites for further characterization: the three current sites of gas diffusion plants. Work on data collection for completion of environmental impact statements for the three sites will continue this year.

The Edison Electric Institute's Nuclear Fuel Committee has published a report "DOE AVLIS Program: An Industry Assessment". The report takes a critical look at the AVLIS program and considers whether the industry should continue to support deployment. In particular, it expresses concern about production cost estimates and the belief that DOE needs to continue working on deployment.

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INDUSTRY BRIEFS

Ontario Hydro to Cancel Denison Contract after 1992

On April 29, Ontario Hydro notified Denison Mines Ltd. that Ontario Hydro will terminate its supply contract for over 3 million pounds of uranium per year, effective January 11, 1993. Since Ontario Hydro is Denison's sole customer for its Elliot Lake production, and Denison has stated its production costs at the Elliot Lake production center are not competitive in the current world market, Denison has announced it will close Elliot Lake operations once deliveries to Ontario Hydro are completed.

Denison's president, Bill James, recently stated that the company is currently reviewing its earlier announced plan for layoffs and temporary plant closures (April 1991 Monthly Report #272). Instead, he says, Denison is likely to maintain production at current levels until enough product is on hand to fulfill the contract, which is expected to be in April 1992, before closing the Elliot Lake facility.

EC Removes Its Sanctions Against South Africa

In recognition of South Africa's progress towards ending apartheid, the European Community (EC) has removed the last EC-imposed sanctions, which applied to iron, steel, and gold coins. However, the EC is maintaining its support of UN sanctions, which apply to sporting events, arms, and crude oil.

The US State Department is still requiring that South Africa remove laws that classify people by race, and free all political prisoners before the USA will lift its sanctions.

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DOE Announces Enrichment Price for FY 1992

The DOE (US Department of Energy) announced on April 3 its price for enrichment services (under the Utility Services Contract) for fiscal year 1992. The current charge of $117.85 per SWU is increased by 3.1 percent, to $121.50 per SWU.

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Soviet Union Gives Up Ownership in Wismut Mines

The Soviet and German governments have reached an agreement, to be signed May 16, whereby the Soviet Union gives up its 50-percent share of the Wismut mines to Germany, in exchange for a release from liability for any environmental cleanup at the mines.

South African U Production Drops 25% in 1st Quarter

South Africa's uranium production fell by 25 percent during the first quarter of 1991. Members of the Chamber of Mines who produce uranium (as a by-product of gold production) reported the following production:

Mine	1,000 lbs U_3O_8	% Change from 4th Q 90
Buffelsfontein	138	– 14%
ERGO	3	– 93%
Hartebeestfontein	139	– 20%
Vaal Reefs	555	– 29%
Western Areas	155	– 9%
TOTAL	**990**	

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Cogema to Close U Division at La Crouzille by 1995

Cogema of France announced it will close mining operations at La Crouzille by 1995, citing that known reserves will only support another five years of production, and that mining costs exceed world prices. The La Crouzille division, located in the Haute-Vienne region, has 10 mines with 600 employees, producing 40 percent of France's current uranium production.

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SOVIET UNION'S ENERGY SITUATION

The Soviet Union is a country of vast sources of energy supply including oil, natural gas, coal, uranium, and hydropower, all of which are used in varying degrees to supply its energy needs. In spite of this wealth of resources, the Soviet Union has difficulty meeting its demand for energy. Opinions on the situation vary, from those who claim the country is in the midst of an energy crisis to those who argue that distribution is the only difficulty. But in any event, the unfortunate fact is that in some areas of the country, energy needs exceed its availability. Until recently, Soviet energy policy concentrated on supply. With the release of its 1983 Energy Program however, the Soviet Union acknowledged the necessity of a fundamental shift in energy policy from the supply side to the demand side in order to curb energy consumption.

ENERGY DEMAND

Energy consumption in the Soviet Union is dominated by natural gas at 39%, followed closely by oil (32%), and coal (22%—**Figure 1**). One of the major challenges facing the Soviet economy is its very high rate of energy consumption per unit of output. For instance, in 1980 the Soviet Union consumed 32 percent more energy per unit of gross national product than did the USA.

For years, consumption has increased because government subsidies have insulated consumers from price hikes. A prime example of the difficulty was the reaction of the Soviet economy to oil shortages caused by domestic production shortfalls during the 1970s. The Soviet economy, as well as that of the USA and other countries, had grown significantly with the stimulus of cheap oil. However, the shortage of oil in the 1970s forced those economies to change. Rather than urging conservation, the Soviet government implemented massive campaigns to boost oil and gas production and to augment its nuclear power program. But because of government subsidies, there were no price increases, and the excess production may have even encouraged less frugal consumption patterns.

In addition to excessive consumption of oil, the Soviet Union also suffers from an inadequate supply of electrical power. Although new electrical generating capacity has been added, it has not been added fast enough to meet increasing demand. Only four of the country's 15 republics generate enough electricity to meet their own needs: Russia, Kazakhstan, Turkmenistan, and Azerbaijan. The federal government has had plans in place to increase total generating capacity; yet supply has fallen short by 60 thousand to 80 thousand GWH for each of the past two years. Power reserves in the Soviet Union's Unified Energy System have dropped to only seven percent of annual peak load. Other major countries average four times that percentage.

Nationwide conservation has been so difficult because the primary consumer has been industry. Since energy consumption is more difficult and expensive to alter in the industrial sector than the residential sector, the historical emphasis has been on increasing energy supply, rather than conservation. The industrial sector accounts for over 50 percent of total energy consumption in the Soviet Union, largely because energy-intensive sectors such as metallurgy dominate Soviet industry. Soviet industry consumes nearly 60 percent more energy per unit of value added than other industrial countries, such as the USA.

ENERGY SUPPLY

Oil

Oil, the Soviet Union's most important source of energy, contributes the largest share of the country's total energy mix (**Figure 2**); it is one of three primary fuels used to

Figure 1
Total Soviet Energy Consumption

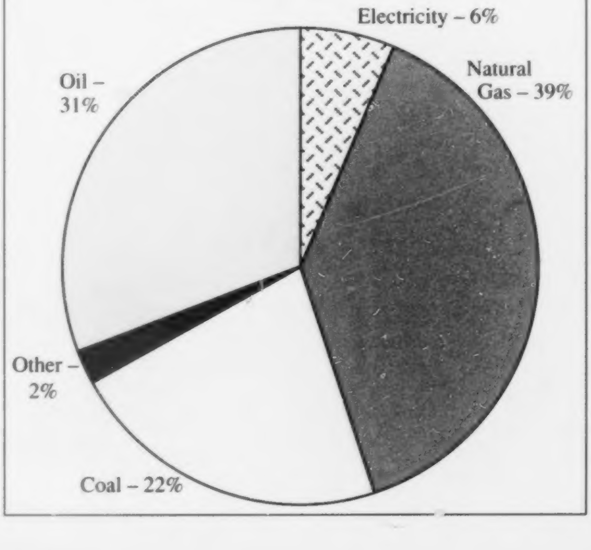

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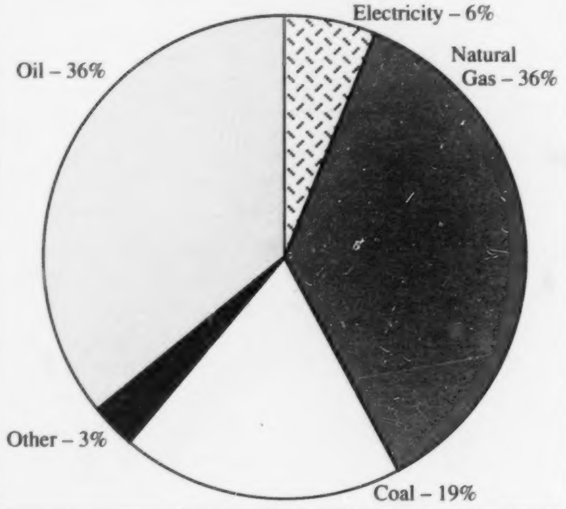
Figure 2
Total Soviet Energy Production



produce electricity in the Soviet Union. Thermal power stations, fueled by oil, coal, or natural gas, generate three-fourths of the nation's electricity.

The Soviet Union is the world's largest oil producer, and has vast untapped reserves estimated at 50 billion barrels, comparable only to the reserves of Saudi Arabia or Kuwait. The Soviet oil industry produces about 12 million barrels of oil equivalent per day (MBOE/d), compared to Saudi Arabia, which produces about 5 MBOE/d, and all of OPEC combined, about 24 MBOE/d. The Tyumen province in western Siberia is the Soviet Union's most important oil-producing area, accounting for over two-thirds of the country's oil output.

The oil sector is facing many challenges that affect economic production of the country's primary energy source and its most important export. These challenges include:

- Depletion of the largest and most accessible reserves in western Siberia. These vast deposits, which sustained the industry for years, are nearing the end of their economic viability.
- Rapidly rising costs of recovery. As the large, easily accessible deposits are depleted, more wells are needed to find and exploit smaller, more isolated deposits.
- High levels of waste and neglect of capital equipment. The former production habits common during the 1960s and 1970s encouraged immediate results, so maintenance of equipment and facilities was neglected, or often not performed.
- Aging and inefficient infrastructure. Since short-term results were encouraged, the infrastructures necessary for long-term growth were never fully developed. Thus, labor problems abound, transportation is often difficult, and now, when new deposits must be exploited, the infrastructure is not available to tap these resources economically.
- Inefficient use of oil. As with all forms of energy in the Soviet Union, consumers are inefficient in their use of oil. Additionally, refineries have also been neglected and have not adapted to the changing fuel needs of the country. Light oil products are in much higher demand, and the old technology at most refineries cannot economically produce sufficient quantities. In fact, in 1990, the Soviet Union exported crude oil, but actually became a net importer of refined petroleum products, such as gasoline.

Reserves difficult to recover economically using current Soviet technology are fast becoming a large portion of the country's total untapped resources. Thus, the oil industry needs major capital improvements to be able to access its vast natural wealth. But with the current economic situation in the Soviet Union, the necessary funds are difficult to obtain. Numerous ventures with Western oil companies are currently being negotiated to develop the huge untapped reserves of eastern Siberia. Agreements under negotiation with companies such as Chevron, Exxon, Royal Dutch/Shell, and British Petroleum could provide the necessary influx of capital to develop these oilfields.

Natural Gas

Natural gas contributes as much energy to the country's total energy mix as oil. Gas-fired stations are the largest source of electricity for the Soviet Union, and their share of total electricity generation is growing. As recently as 1982, the natural gas contribution to total electricity generation was less than that of coal or oil, but aggressive efforts by the government have made natural gas the primary fuel source for electricity. The Soviet Union holds

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massive reserves of natural gas, perhaps as much as 40 percent of the world's reserves. The largest deposits are located in Tyumen in western Siberia, the same area as the country's largest oil deposits. The other major Soviet gas-producing region is located in central Asia, in the republics of Uzbekistan, Turkmenistan, and Kazakhstan.

Challenges to the natural gas industry are similar to those facing the oil industry: aging production equipment and an inadequate infrastructure. The pipelines that transport gas across the country are also in poor condition, and serious explosions from leaking pipes have occurred. The government is working to remedy the inadequate pipeline system, but the country has thousands of miles of pipe in need of repair, and limited capital to fund the repairs.

Environmental and social challenges also face the gas industry. Exploitation of some of the gas deposits in northern Siberia has drastically affected the fragile environment and the way of life of the native residents of the region. In response to local protests, the government has postponed development of some of the most sensitive areas and will focus its exploration and development efforts on two less politically sensitive deposits.

While the gas industry is not without its problems, it is in better condition than any other energy sector in the Soviet Union. Severe problems in the coal and nuclear industries have limited their contributions to Soviet energy production, and persistent problems with inefficient consumption by industry and consumers have led the Soviet government to try to compensate by boosting production targets for natural gas. Recognizing the benefits that gas exports can bring to the country's economy, the Soviet government is encouraging gas production by providing limited capital assistance to the industry.

Coal

Coal contributes 19 percent of total Soviet energy production, and accounts for over 22 percent of the country's electricity generation. Just as with oil and natural gas, the Soviet Union's coal reserves are vast, estimated at over 270 billion tons of recoverable reserves. This includes reserves from the Donbas coal region in the Ukraine, and also reserves in Siberia and Central Asia. The Donbas coal region is the country's largest coal-producing area, although production has recently been reduced due to increasing production depths and lower caloric value of the coal. Total Soviet coal production peaked in 1988 at 772 million metric tons, but has fallen to about 760 million metric tons per year since that time.

The Soviet coal industry is experiencing some major difficulties, the most immediate of which is the breakdown of labor-management relations. A nationwide coal miners' strike in 1989 resulted from poor and unsafe working conditions, as well as inadequate housing and wages for miners. Because of the government's eagerness to settle the strike quickly, and thus prevent it from spreading to the railway and steel industries, officials accepted very stringent terms, many of which they have been unable to implement. Consequently, many of the miners' demands have not yet been fulfilled.

Another major problem is the new government strategy of devoting its resources to development of new coal fields at remote locations in Siberia and south-central Asia. The Donbas deposit is located nearer the population centers, but its reserves are declining in quality (falling heat content; rising ash content). The newly developed reserves at greater distances from demand centers accentuate the inadequacies of the poorly maintained rail transportation system.

Much of the coal being mined in the eastern coal fields is of lower quality than that produced at Donbas; only coal from the Kuzbas deposit is of comparable quality. Also, the coal from Kuzbas is the only eastern-mine coal that can be transported long distances, since the coal of the other mines can easily self-ignite during transport.

To address these problems, government strategy called for construction of eight major coal-fired power stations next to the mines, to generate electricity to be sent by high-voltage power lines to western Soviet population centers. However, strong environmental protest to the plants and power lines has effectively reduced the plan to only two power stations, lessening the demand for coal, thereby creating unused production capacity.

The coal industry may be further hindered by a growing public and scientific awareness of the pollution and potential global warming effects from coal-fired stations. The industry and the power it can provide are vital to the country and its economy, but labor relations, coal quality, transportation, and environmental concerns present major obstacles.

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ANALYSIS AND COMMENTARY

Nuclear Power

After the USA and France, the Soviet Union is the third-largest nuclear electric generating country in the world. In 1989, nuclear power generated 212,600 GWH of electricity, which represents about 12.5 percent of the total Soviet electricity generation (**Figure 3**). The average load factor in 1989 for all of the operating nuclear plants was 69.3 percent.

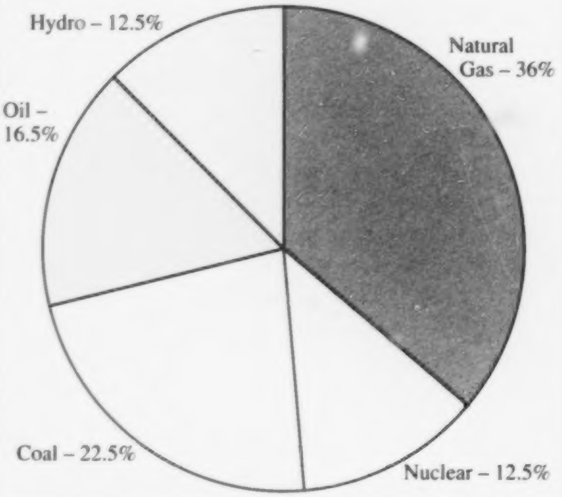
The Soviet Union currently operates 47 commercial power reactors at sixteen different stations with a total generating capacity of 33,810 MWe net. This includes 25 VVERs (similar to pressurized water reactors), 20 RBMKs (graphite moderated, channel-type reactors), and 2 FBRs (fast breeder reactors). Ten reactors are still under construction, and the country also has a number of nuclear-powered district heating stations operating and under construction.

The Soviet Union's operating nuclear power stations are located primarily in the western part of the country, where the large majority of the 280 million Soviet citizens live. The stations are located in four of the 15 different republics that make up the Soviet Union. Nine stations are located in Russia, the country's largest republic; the others are located in the Ukraine, Lithuania, and Kazakhstan (**Figure 4**). Two new reactors (Smolensk 3 and Zaporozhe 5) began commercial operation in the past year or so, but plans for additional reactors have been cancelled or indefinitely postponed. Several units, both operating and under construction, have been shut down or cancelled.

The Soviet Union's nuclear program is experiencing the same challenges of reactor safety, waste disposal, and public acceptance facing Western nuclear programs. The government's 1985 five-year plan called for nuclear power to provide 20 percent of the country's electrical power by 1990; actual output was approximately 12 percent—a shortfall of greater than 150 thousand GWH. Public pressure in the late 1980s delayed or stopped nuclear projects totalling over 100 gigawatts. A few years ago it was unthinkable that local opposition would be able to halt construction. But since the Chernobyl accident in 1986, the government has increased its emphasis on safety at its facilities and recently has begun responding to local concerns.

The Soviet government remains firmly committed to nuclear power because it realizes the country's need for energy supplies to further economic growth. The government announced in 1990 that it will concentrate on building VVER–1000 reactors, with the assistance of Western safety expertise. Pro-nuclear groups within the government stress that emotional opposition is threatening nuclear power, and that this major source of power must be sustained and play a vital role in the development of the country.

Figure 3
Soviet Electricity Generation by Source



Hydroelectric Power

Hydroelectric power generation has grown slowly in the Soviet Union, but has actually decreased as a percentage of total electricity generation. Government plans called for hydropower to contribute 14 percent of the nation's electricity generation by 1990, and to gradually increase its contribution each year. Hydroelectric power did manage to contribute nearly 13 percent of the nation's electricity generation in 1989, but its contribution subsequently decreased.

Massive hydroelectric projects were planned for Siberia, the northern Caucasus, the Baltics, central Asia, and several stations along the Volga River. Yet environmental concerns have significantly slowed progress of these projects. In addition, the wide seasonal fluctuations in water levels on most Siberian rivers have made large hydroelectric stations less economic than originally expected.

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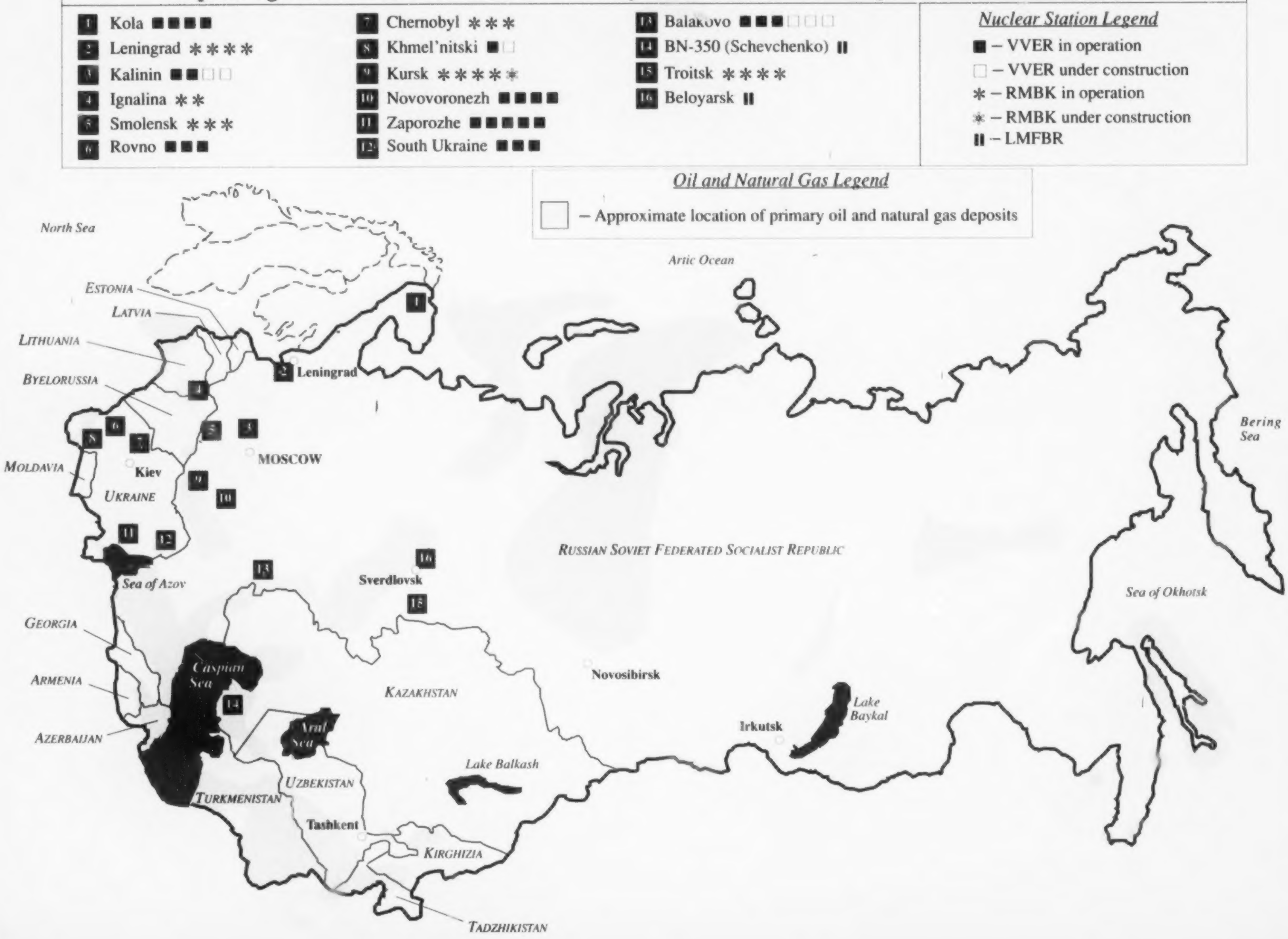
Figure 4
Operating Nuclear Power Stations, and Primary Oil and Natural Gas Deposits in the Soviet Union


1 Kola ■■■■
2 Leningrad ✱✱✱✱
3 Kalinin ■■□□
4 Ignalina ✱✱
5 Smolensk ✱✱✱
6 Rovno ■■■
7 Chernobyl ✱✱✱
8 Khmel'nitski ■□
9 Kursk ✱✱✱✱✱
10 Novovoronezh ■■■■
11 Zaporozhe ■■■■■
12 South Ukraine ■■■
13 Balakovo ■■■□□□
14 BN-350 (Schevchenko) ‖
15 Troitsk ✱✱✱✱
16 Beloyarsk ‖
Nuclear Station Legend
■ – VVER in operation
□ – VVER under construction
✱ – RMBK in operation
✱ – RMBK under construction
‖ – LMFBR
Oil and Natural Gas Legend
□ – Approximate location of primary oil and natural gas deposits
North Sea
Artic Ocean
Bering Sea
Sea of Okhotsk
Estonia
Latvia
Lithuania
Byelorussia
Moldavia
Leningrad
Moscow
Kiev
Ukraine
Sea of Azov
Georgia
Armenia
Azerbaijan
Caspian Sea
Aral Sea
Sverdlovsk
Russian Soviet Federated Socialist Republic
Kazakhstan
Novosibirsk
Irkutsk
Lake Baykal
Lake Balkash
Uzbekistan
Turkmenistan
Tashkent
Kirghizia
Tadzhikistan

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EXPORTS

Energy exports are a vital source of hard currency to the Soviet Union. In 1988, the country exported about 35 percent of its domestic oil production and 12 percent of its natural gas production. Oil and natural gas exports together accounted for over 40 percent of the country's entire convertible currency earnings in 1988. Energy exports accounted for 17 percent of total consumption.

The Soviet government recognizes that energy exports are essential. Until the country is more fully developed and can successfully export quality manufactured goods to Western countries, raw material exports are the Soviet Union's most important source of hard currency. Demand for convertible currency is increasing in proportion to the country's demand for consumer and industrial goods from the West. Thus, increases in energy exports are needed to make a significant improvement in the country's convertible currency earnings.

The Soviet Union finds itself in a difficult situation: it needs convertible currency to import equipment needed for major capital improvements, but without the improvements, it cannot economically recover its raw material resources, which are the country's primary means of generating convertible currency.

OUTLOOK

In 1989, a major review of Soviet energy policy was released, based on the findings of an expert commission that had been at work since 1985. The review resulted in the following recommendations:

- A major new commitment to energy conservation, starting with sharp price increases for energy.
- A reduced, though still substantial, commitment to nuclear power.
- A stabilization of oil and condensate output.
- A continued rapid expansion of natural gas output, and displacement of oil by gas throughout the economy.
- A radical modernization and expansion of the equipment and construction industries serving the energy sector.
- A continued commitment to energy exports.

The commission's primary objective was to provide a practical strategy for handling the transition from a production-oriented to a demand-oriented energy policy. This strategy involves dividing the move toward conservation into two stages—one of preparation and one of active execution. On the supply side, the first phase concentrates on the stabilization of oil output, while vigorously developing gas and nuclear power. On the demand side, the commission stressed measures that would not require large investments, but would prepare the way for the second stage. These measures included improvements in measurement of consumption, oversight, accountability, and incentives (price increases).

In the second stage, reductions in consumption are expected from modernization of technological processes and further electrification of industry. Additional reductions are expected from lower use of energy-intensive materials. Energy consumption by industry and construction in the Soviet Union, although high by Western standards, is already declining. Heavy industry is giving way to advanced technology sectors, such as electronics, robotics, and computers. Chemistry and machine building are expected to increase in relative importance, while sectors such as ferrous metallurgy are expected to decline.

The plan is an optimistic one, requiring increases of over 20 percent of the country's total investment budget for the next 15 to 20 years. However, such increases are essential if the Soviet Union is to accomplish its long-term goal—the transition to energy conservation with simultaneous protection of the economy's energy supply.

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JABILUKA URANIUM PROJECT

The Jabiluka gold and uranium deposit in the Northern Territory of Australia is the world's largest known primary uranium deposit. Exploration first began in 1968, and in March 1971 Pancontinental Mining Ltd. acquired a "Prospecting Authority" for an area of 186 square kilometers within the Alligator River area of the Northern Territory. The Jabiluka One orebody was discovered later that year through a ground reconnaissance spectrometry survey. The Prospecting Authority was converted to an Exploration License in March 1972. In 1973, the Jabiluka Two orebody was discovered by drilling to the east and along the strike of Jabiluka One.

Land holdings under the Exploration Permit were progressively reduced, as required by law, during the period 1972-1977, but other leases were acquired to cover supplemental areas and to provide for the extraction of gold and other minerals. Feasibility studies, permitting, and substantial marketing were completed by December 1982. However, with the advent of Australia's three-mine policy, project approval was withdrawn by the Labor Government in 1983. To date, the Jabiluka project remains undeveloped, and the Australian Labor Party's review of its three-mine policy during its biennial convention this summer will determine the future of the project for this decade.

Ownership

The Jabiluka uranium property is owned jointly by Pancontinental Mining Limited (65 percent) and Texaco Oil Development Company (35 percent). Pancontinental's option to purchase Texaco's share in the project was extended one year, to November 1991. Pancontinental likely will exercise that option when the project receives development approval from the government.

Pancontinental Mining Limited, an Australian-owned and controlled diversified mining company, was founded in 1970. Its initial objective was mineral exploration, with an emphasis on uranium. Currently, the principal activities of Pancontinental and its subsidiaries consist of gold and coal production in Australia. Production of tantalum and base metals is expected to commence shortly, and a decision is imminent concerning a magnesite development that could begin operations in late 1991.

Pancontinental is currently in a state of flux, both structurally and financially. The company's half-year results for the period ending December 31, 1990 included a loss of A$83.7 million, after write-offs of A$87.8 million. Early in 1991, the company reported the sale of several non-core assets, including its 38-percent share in the Canadian-based company, Pancontinental Oil Ltd., and a 9.6 percent shareholding in itself. Although the company raised A$28 million from the sale of its oil and gas interests, and an additional A$22 million from the sale of Pancontinental shares, these sales resulted in losses to the company. A portion of these losses were written off against "listed and other investments" in the half-year results. The funds raised through the asset sales will reduce the company's level of debt, which may aid in a refinancing package which is currently underway.

In addition to this financial restructuring, significant corporate restructuring is also underway. Mr. Tony Gray stepped down as Pancontinental Mining's Chief Executive, although retaining his position as Executive Chairman. As a result, Pancontinental is now in the process of recruiting a new Chief Executive. This task is being performed by a newly established board committee, which also has responsibility for non-strategic asset sales, improving management efficiency, and reducing costs.

During 1990 and early 1991, four companies increased their holdings in Pancontinental. Major shareholders and their respective ownership shares in the company currently include:

Cogema Australia Pty Limited	14.9%
Degussa AG	14.0%
North Broken Hill Peko Limited	13.8%
Rheinbraun Australia Pty Limited	5.4%

Location

The Jabiluka uranium and gold deposits occur in the East Alligator River region, about 225 kilometers east of Darwin (**Figure 1**). The Alligator River region consists of an extensive lowland (10 to 50 meters above sea level), with floodplains, seasonal drainage channels, and waterholes. Jabiluka is located at the western margin of the Arnhem Land Plateau, a sandstone escarpment that rises 250 meters above the lowlands.

Access to the project is via the all-weather Arnhem Highway, thence 16 km along an unsurfaced road. An airstrip is available at Jabiru, 16 km to the south, with

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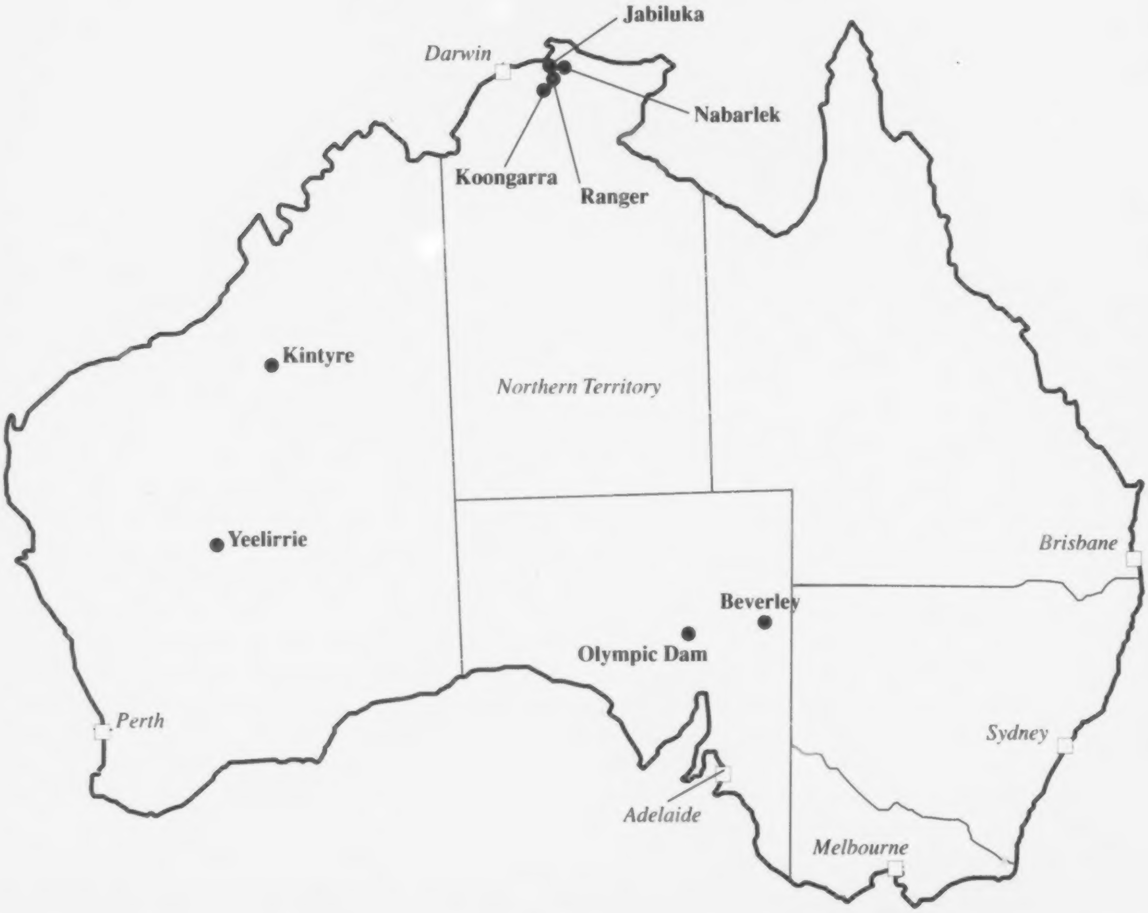
Figure 1
URANIUM DEPOSITS OF AUSTRALIA



commercial airline service operating out of the airport at Darwin. No operational rail lines exist within 1,100 km of the Jabiluka deposits, although a 500 km rail line operated out of Darwin at one time.

The Jabiluka deposits are situated within, although excluded from, the Kakadu National Park, which encompasses two-thirds of the Alligator River region. The Park has been included in the World Heritage List, which identifies areas of "outstanding universal value." Enclosed within the Park are sacred or mythological sites significant to Aboriginal peoples of the area. internationally important wetlands, mangroves of scientific interest, and extensive archeological sites.

Property Rights

Property rights to uranium exploration and development in Australia's Northern Territory (NT) are governed, primarily, by the Northern Territory Mining Act of 1980. This Act provides the framework for both exploration licenses and mining leases.

Title to uranium deposits in the NT is vested in the federal government, and thus, the provisions of the Mining Act are also subject to Australia's Atomic Energy Act (AEA) of 1953. The AEA empowers the Australian Prime Minister to authorize exploration for, and production of, uranium. Pancontinental's property rights were consolidated into Mineral Lease MLN1 in August 1982. The lease covers 70 square kilometers and was issued for a period of 42 years.

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Where Aboriginal lands are involved, both the Mining Act and AEA are subject to the provisions of the Aboriginal Land Rights Act (Northern Territory)—1976. This Land Rights Act established Land Councils of local aborigines. The Councils control exploration and mining activities within their own lands. No exploration license may be granted to Aboriginal lands without Council approval.

To obtain a mining lease on land covered by the exploration license, a full statement of the proposed activity must be submitted to the relevant Land Council. The Council and the company requesting the lease must then agree on the terms and conditions of the lease. If agreement cannot be reached, the questions may be resolved by conciliation or arbitration. The company need not be bound by such resolution, but the mining interest may be cancelled if the terms are not accepted. If the mining interest is cancelled, the land cannot be reopened for lease for five years.

Licensing

By the end of 1982, all necessary mining and environmental approvals for Jabiluka had been obtained from the Commonwealth and Northern Territory Government, and agreement with the Northern Land Council on behalf of the Aboriginal Associations had been reached. The Commonwealth had also issued Letters of Determination permitting developers to seek sales contracts. The Letters of Determination were withdrawn in 1983, however, by the incoming Labor Government and its limited production policy. The Jabiluka project is still undeveloped, awaiting a change in policy by the Australian Government.

Environment

In the 1970s, a massive production scheme of over 20 million pounds U_3O_8 per year was proposed for Jabiluka. Even though production plans have been scaled back, the huge production potential and the project's location in Kakadu National Park (the location of the filming of the popular Crocodile Dundee movies), drew increased attention. Such factors have increased the sensitivity of the project and provide the venue for potentially restrictive regulation.

When the Jabiluka project reaches the production stage, it will be required to fund much of its own environmental scrutiny through an export fee, which will pay for the activities of the Supervising Scientist of the Alligator River district, who provides oversight on uranium producers in that district. This export fee has been raised progressively from A$0.11 per kg U_3O_8, to A$0.80, to A$1.02, and finally, to A$1.30 per kg U_3O_8 in July 1989.

Marketing and Development

Before the formation of the Australian government's three mine policy in 1983, Pancontinental was actively marketing production from Jabiluka. Negotiations were underway with the British Civil Uranium Procurement Organization (BCUPO), which was buying uranium on behalf of the Central Electricity Governing Board (CEGB), to supply a minimum of 4.3 million pounds U_3O_8 over a ten-year period beginning in 1988. In addition, Nichimen had obtained exclusive distribution rights from Pancontinental for the sale of uranium in Japan. These plans, however, expired when an export license was denied in 1983.

Pancontinental is currently evaluating two basic options for development of the Jabiluka deposit. One option involves development through equity participation of potential utility customers in Asia, Europe, and the USA. This option would provide not only a source of development funding, but also a market for the uranium once production commenced.

A more likely alternative is development in conjunction with ERA, which is 65 percent owned by North Broken Hill Peko, one of Pancontinental's major shareholders. ERA operates the Ranger mine/mill complex, located only 15 km from Jabiluka. The Ranger No. 1 open pit mine, which has been in production since 1981, is expected to be mined out by mid-1993. Under the potential joint-venture development plan, ore from the Jabiluka deposit would be transported by truck, conveyor, or slurry pipeline to the Ranger site, where processing would occur. The Jabiluka deposit is larger and higher grade than the Ranger No. 3 orebody, which was originally scheduled for development upon exhaustion of the No. 1 orebody. One of the benefits of the Ranger-Jabiluka joint development option is the reduction in development costs that would result from using an already existing mill facility. It is also possible that the joint development plan could go forward without a change in the Australian government's current three-mine policy. Although the joint development option would be less environmentally sensitive than independent development, it is not without its own environmental concerns. The issues of ore transport, as well as the disposal and water management associated with increased tailings, have come under scrutiny.

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Capital Costs

Capital costs for the independent development of the Jabiluka project have been estimated by Pancontinental in the range of A$200 million to 250 million. At an exchange rate (May 1991) of US$0.78/A$1.00, the cost range would be US$156 million to 195 million. A 20-year depreciation period at a production rate of 3.3 million pounds U_3O_8 per year would result in a depreciation charge of approximately US$2.35 per pound U_3O_8.

Royalties

In 1982, Pancontinental reached an agreement with the Northern Land Council to provide a series of royalty payments to the traditional landowners. Royalties to be paid under the following terms were included in the draft agreement:

- After Ministerial approval of the project, A$1.0 million, and another A$800,000 over the next four years.
- For each of the five years after agreement is reached for the sale of at least 3,000 tonnes of uranium oxide, A$1.2-million per year; for three years starting one year after approval of the mining agreement, A$1.2 million per year.
- When production starts, A$3.4 million.

Royalties under the draft agreement would be 4.5 percent of Jabiluka's revenue, plus $500,000 a year for the first ten years, and thereafter, 5.0 percent of revenues.

URANIUM POLICY CONSIDERATIONS

The Australian political scene is dominated by two political groups: a conservative coalition of the urban-based Liberal Party and the rural-based National Party; and the Australian Labor Party (ALP).

The ALP is currently in power and has formulated Australia's existing uranium policy of limited production. The policy was set in July 1984 at the ALP's biennial national conference. This conference endorsed continued production at Nabarlek, expanded production at Ranger, and development of Olympic Dam, but rejected the development of other uranium deposits. The policy of the Liberal/National group holds that the development of Australian uranium production should be dictated by market forces alone. A principal concern of both groups is the non-proliferation of nuclear weapons; how this end is achieved provides the major policy difference. In the past, the ALP has supported limited production, while the conservatives believe the country should become more fully involved in all phases of the nuclear fuel cycle.

In addition to approval of specific projects, the current Australian uranium policy includes these other factors:

- The customer's government must have a bilateral safeguards agreement with the Australian government.
- Contractual terms must be within broad guidelines set down in Ministerial Determinations issued to each producer.
- All new contracts are subject to the approval of the Australian government. Approval is assured provided the producer stays within the guidelines set in the Determination.
- Export is subject to compliance with a Restricted (Dangerous) Goods permit issued by the Australian government.
- Foreign ownership of a uranium production facility is limited, nominally, to 25 percent.

Starting in 1986, the government began showing some signs of relaxing its strict policies. The government's increasing pragmatism was evident when it decided to allow Queensland Mines Limited (QML) to resume uranium shipments to Electricité de France (EdF). Those shipments had been banned for two years, and the Australian government had been purchasing the uranium that QML otherwise would have delivered to EdF. The ban had been imposed by Australia in an attempt to force curtailment of France's nuclear weapons testing in the South Pacific. However, it had become evident the ban was counter-productive: EdF was able to purchase uranium from other sources at lower prices, and the Australian government was forced to expend funds needed for other programs to purchase uranium for which Australia had no need. Furthermore, the ban had no effect on France's nuclear test program, and also brought into question Australia's reliability as a long-term uranium supplier. Lifting the ban was a victory for commercial reality over political rhetoric.

A primary obstacle impeding Australia's movement into the forefront of world uranium suppliers had been the government's strict floor price policy. By late 1989, this policy had been essentially rendered ineffective. The government had approved several long-term contacts well below the official floor price of A$31.00 per pound U_3O_8. The government also had issued a statement

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that future contract price levels would be "determined at a level which reflected the national interest in particular circumstances, and market conditions in which the contracts are negotiated".

The third restriction to growth, the government's three mine policy, is also under scrutiny. The current interpretation is that it is a three "named" mines policy; that is, it was intended to allow only three specific mines to operate. The policy states that mines at Nabarlek, Ranger, and Olympic Dam could produce. It does not assert that when one center shuts down (e.g., Nabarlek) a new facility can start up. However, this policy will be under review at the ALP's 1991 national conference. Currently, the Labor party is sharply divided over the issue; in general, the right faction supports new mines, while the left faction is pushing for uranium mining to be phased out altogether. Early this year, Primary Industries Minister, John Kerin, came out publicly in favor of overturning the current policy. Furthermore, in a five to three vote, the federal government's uranium policy review committee decided to recommend the development of new mines that meet stringent environmental and safety standards, as well as approval by local Aboriginal landowners.

For Australia, with its emphasis on long-term relationships, flexible and realistic policies are essential to its credibility as a reliable source of supply. It is in the long-term interest of the country's economic success that its policies continue to become more flexible.

GEOLOGY

Exploration History

The East Alligator River region became interesting to prospectors following a 1968 announcement by the Australian Bureau of Mineral Resources that Archean and Lower Proterozoic rocks had been tentatively identified in the area. This indicated a geologic, and possible mineralogic, analogy to that of the uranium-rich Rum Jungle region on the west side of the Pine Creek Geosynocline. Consequently, prospecting of the East Alligator River region began almost immediately. Due to the lack of rock outcroppings throughout the region, aerial surveys using radiation detection instruments became the favored exploration technique. These techniques led to the 1970 discoveries at Ranger, Nabarlek, and Koongarra, and to the 1971 discovery at Jabiluka.

Regional Geology

The Pine Creek Geosynocline represents the principal geologic feature of the entire region. Archean and Lower Proterozoic rocks have been moderately folded across the north/south trending synclinorium, which extends from the Rum Jungle area in the west, to the East Alligator River area in the east. The major uranium orebodies in the Northern Territory—Ranger No. 1 and No. 3, Koongarra, Jabiluka, and Nabarlek—all occur along the east flank of the synclinorium structure.

Sediments of Lower Proteozoic age were deposited over the Archean basement in sequences, starting with the Lower Mine Sequence, Upper Mine Sequence, and Hanging Wall Sequence of the Lower Cahill Formation, followed by the Upper Cahill Formation and the Nourlangia Schist. Each depositional sequence was intensely metamorphosed during renewed igneous activity consisting of intrusions of granite and pegmite and basic dikes, all considered to be related to the Nanambu basement complex. Evidence of brecciation occurs along formation contacts, fault and fracture zones, and alteration collapse features. Igneous activity and metamorphism began about 1,800 million years ago and ended about 1,650 million years ago.

Site Geology

The Jabiluka orebodies occur within the Cahill Formation, a sequence of Lower Proterozoic metasediments. The metasediments are overlain, unconformably, by the Kombolgie Sandstone. The metasediment sequence has been folded into an assymmetric syncline dipping 35 degrees on the northside and flat-lying on the southside. The Jabiluka One orebody outcrops through a erosional window of the Kombolgie Sandstone, while Jabiluka Two is covered by 20 to 70 meters of the Kombolgie.

The primary host for uranium mineralization at Jabiluka is the Main Mine Series Schist, which includes a series of schists totalling 15 to 70 meters in thickness. The components of these schists include chlorite, graphite, quartz, muscovite, chert, and dolomite.

Pitchblende and uraninite are the principal uranium minerals, occurring in both disseminated and massive forms. The uranium mineralization is associated with sulfides, particularly pyrite and chalcopyrite. Gold mineralization is associated with uranium mineralization in Jabiluka Two, and occurs within uraninite grains or as cross-cutting veinlets. Estimated current reserves are listed in **Table 1**.

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OPERATIONS

Mining

The Jabiluka deposit is the world's largest primary uranium deposit and contains substantial amounts of gold. Under the independent development plan proposed in 1979, the project would be developed as an underground mine with a production rate of about 2,000 tons of ore per day on a five-day week. The mill would operate seven days per week at about 1,500 tons per day. Once developed, Jabiluka would produce near its planned capacity of 3.3 million pounds U_3O_8 per year. The project also would produce up to 30,000 ounces of gold per year as a by-product.

A fully-mechanized, trackless mining system was planned in 1979. Under this plan, broken rock would be transferred through ore and waste passes to truck haulage levels connected to a central underground crushing system. Two declines (gradient 1:8)—one, a conveyor decline, and the other, a vehicular access with twin haulage decline—would provide mine access.

Three mining systems would be used to mine the ore body: open stoping, vertical crater retreat (VCR) stoping, and cut-and-fill stoping. Cut-and-fill methods are used in narrow lenses, which represent ten percent of the ore body.

In open stoping, the stope is developed with draw points in the footwall and drill drives in both the footwall and hanging wall. An initial raise connection is made through the stope using a raise borer. The raise is expanded to a narrow slot; a series of blast hole fans are drilled parallel to the slot and blasted sequentially into the opening. Broken ore is extracted after each blast. After completion, the stope is backfilled to permit extraction of the adjacent stope.

Table 1
ESTIMATED JABILUKA RESERVES

Deposit	Ore (1,000 tonnes)	Grade (% U_3O_8)	Contained U_3O_8 (1,000 tonnes)
Jabiluka One	1,300	0.25	3.4
Jabiluka Two [1]	52,000	0.39	204.0
Total	**53,300**	**0.39**	**207.4**

[1] Jabiluka Two also is estimated to contain 11,800 kg of gold at a grade of 10.7 g/t AU.

The VCR stoping method is similar to open stoping with similar initial development. However, the blast holes are large diameter (250 mm) and nearly vertical. The ore is blasted in horizontal slices downward, differing from open stoping in which the ore is blasted in vertical slices. These stopes would also be backfilled.

For open stoping and VCR stoping, the ore body would be divided into stoping blocks separated by pillars. The blocks would be subdivided into a series of individual stopes, with the primary stopes being mined by open stope methods and the secondary stopes, by VCR methods. Walls of the primary stopes would be rock; walls of the secondary stopes would be rock and cemented fill. Finally, pillars would be mined by the VCR stoping method.

It is expected that after initial dewatering during development, water inflow to the mine workings would be less than 400 liters per minute.

Both ore and waste would be crushed in an underground crushing station at a rate of up to 550 tonnes per hour. Crushed material would feed to an inclined belt that would convey the material to the mine portal, where a six-kilometer belt conveyor would transfer the ore to the treatment plant.

Milling

Mine-run ore feed would be crushed underground to 100 percent minus 200 mm and delivered to the mill site by conveyor. At the mill site, the ore would be crushed in a 2,150 mm secondary crusher and a 2,150 mm tertiary crusher, to produce a 100 percent minus 25 mm product.

The crushed ore would be wet ground in an open circuit rod mill (3.2-meter diameter by 4.9-meter long) followed by a ball mill (3.65-meter diameter by 5.97-meter long). The ball mill would operate in closed circuit with cyclones to produce a 50 percent minus 75 micron product.

The product would be thickened (in a 41 m thickener) to 60 percent solids, with the overflow returning to the grinding circuit. The thickened product would be air agitated in Pachuca tanks, to which sulfuric acid and pyrolusite (oxidant) would have been added. Pulp temperatures would be maintained at 40°C with steam. Treatment time would be 36 hours.

After leaching, the uranium-bearing solution would be separated from the solids in a counter-current decantation circuit consisting of a series of seven thickeners, 49 meters in diameter. The uranium-rich, pregnant solution would overflow the first thickener, and the washed solids would discharge from the last thickener. The pregnant solution would be clarified and filtered

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prior to solvent extraction. The washed solids (uranium tailings) then would be pumped to the gold flotation plant.

The clarified pregnant solution would be sequentially mixed with organic reagents in a four-stage extraction process where the uranium would be transferred to the organic phase. The uranium next would be stripped from the organic phase in a four-stage stripping circuit, producing a uranium-bearing ammonium sulfate solution ready for precipitation.

Uranium would be precipitated with ammonium gas that would increase the solution pH to 7.5. The ammonium diuranate precipitate would be thickened, dewatered, and roasted in a multiple-hearth furnace. After crushing to minus 6 mm, the yellowcake would be packaged for marketing.

The gold flotation-cyanidation plant would be designed initially to treat 3,200 tonnes per day of uranium tailings. The cyanidation circuit would be designed to treat 600 tonnes per day of flotation concentrates.

The uranium tailings feed to the flotation circuit would be first neutralized by lime to a pH of 7.0. In the flotation circuit, the gold and gold-bearing minerals would be selectively floated using reagents consisting of collectors, promoters, and frothing agents. The concentrates would be sent to the cyanidation plant; the tailings, to tailings disposal.

In the cyanidation plant, the concentrates first would be treated in Pachuca tanks with a cyanide solution to dissolve the gold. Lime would be added to maintain an alkaline environment. After leaching, the pregnant gold-bearing cyanide solution would be separated from the solids in a counter-current decantation system.

The pregnant solution, after clarification, would be treated with zinc dust to precipitate the gold. After filtering and drying, the precipitate would be melted with suitable fluxes to produce a saleable doré bullion bar. The cyanide process tailings would be washed to remove residual cyanide and pumped to the tailings neutralization circuit. As the Jabiluka project is undeveloped, final mine and treatment plant designs are still in a preliminary stage.

CONCLUSION

The Jabiluka uranium project has the potential to become one of the most important uranium projects in the world. Despite the financial and structural challenges facing Pancontinental, and the changing political policies in Australia, Jabiluka is well situated for development during the 1990s. With the availability of numerous financial and development alternatives, Jabiluka could, by the turn of the century, take its rightful place among the first rank of world uranium producers.

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NUCLEAR INDUSTRY CALENDAR

1991

June 2-6	***American Nuclear Society Annual Meeting*** (Marriot Orlando World Center, Orlando, Florida). Contact: ANS Meetings Department; 708-352-6611.
June 9-12	***Nuclear Technology: Building Our Energy Future*** (Sheraton Cavalier Hotel, Saskatoon, Canada). Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society. Contact: Sylvie Caron, CNA; 416-977-6152; or Fax: 416-979-8356.
June 23-26	***International Conference on Enrichment*** (The Westin Hotel, Washington, DC). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29-Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES, 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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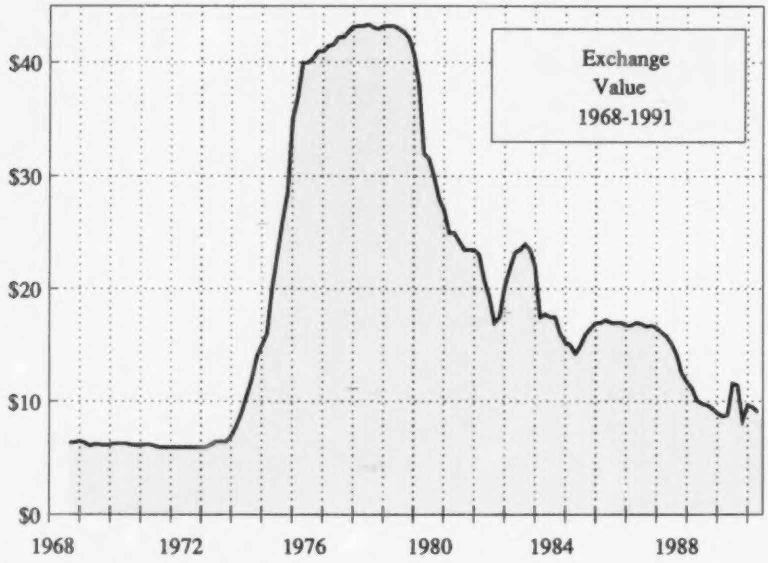
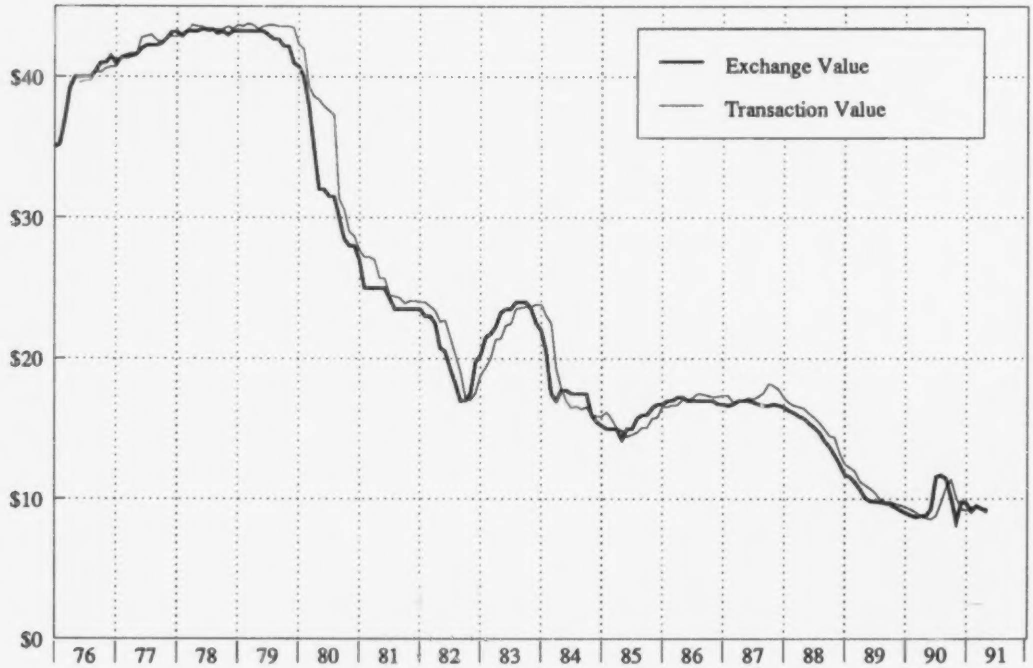
NUEXCO Historical Exchange Value and Transaction Value

(in US dollars per Pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	**9.10**								

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF_6 Values

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	**27.25**								

US Premium (Relative to the UF_6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	**1.45**								

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	**9.30**								

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	**52**								

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Loan Rates

Year	Determined as of the last day of the month indicated (Percent per Annum)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	**3.50**								

* Float with Prime Rate

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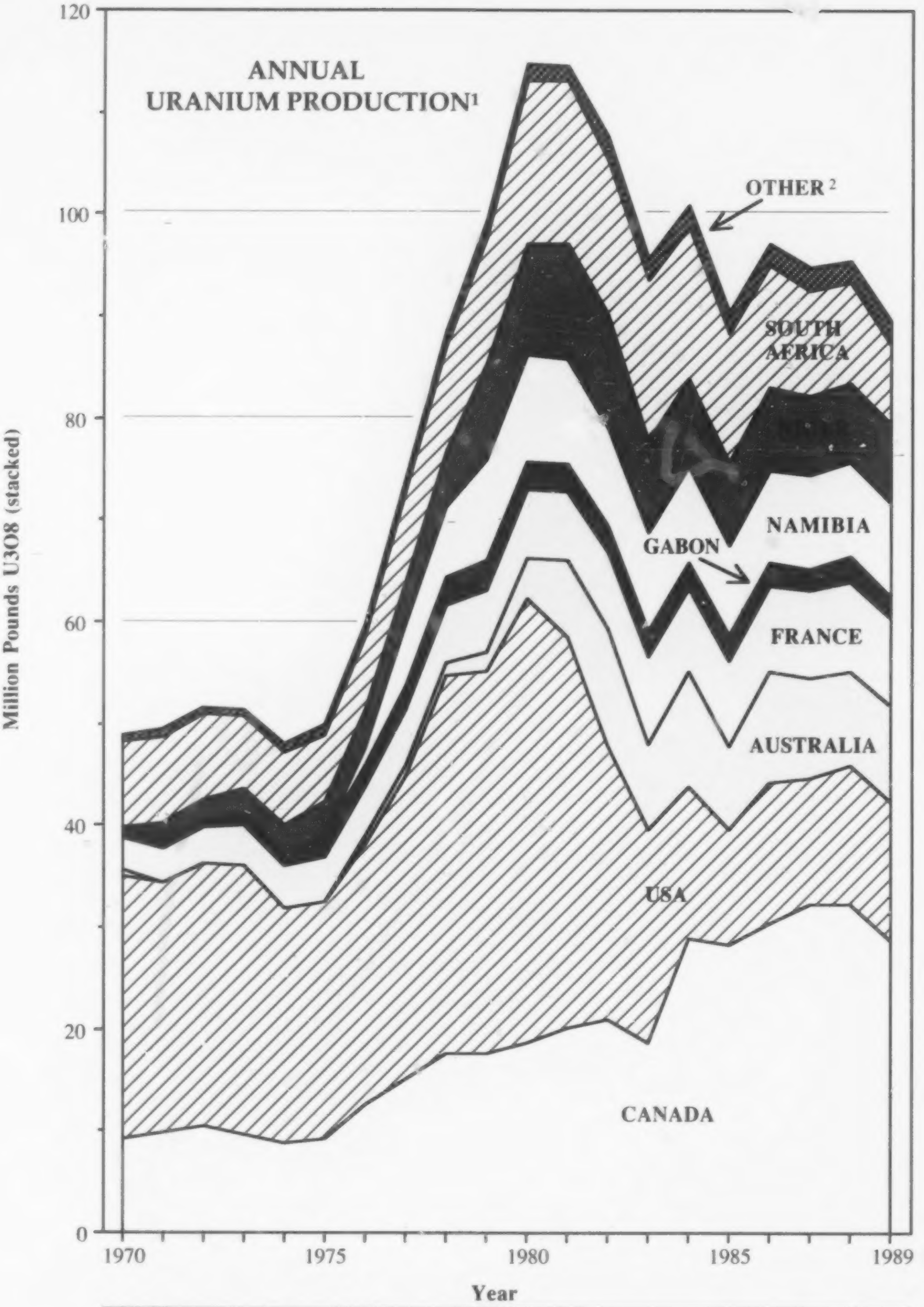

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others [2]—2.3).

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, (West) Germany, and Yugoslavia

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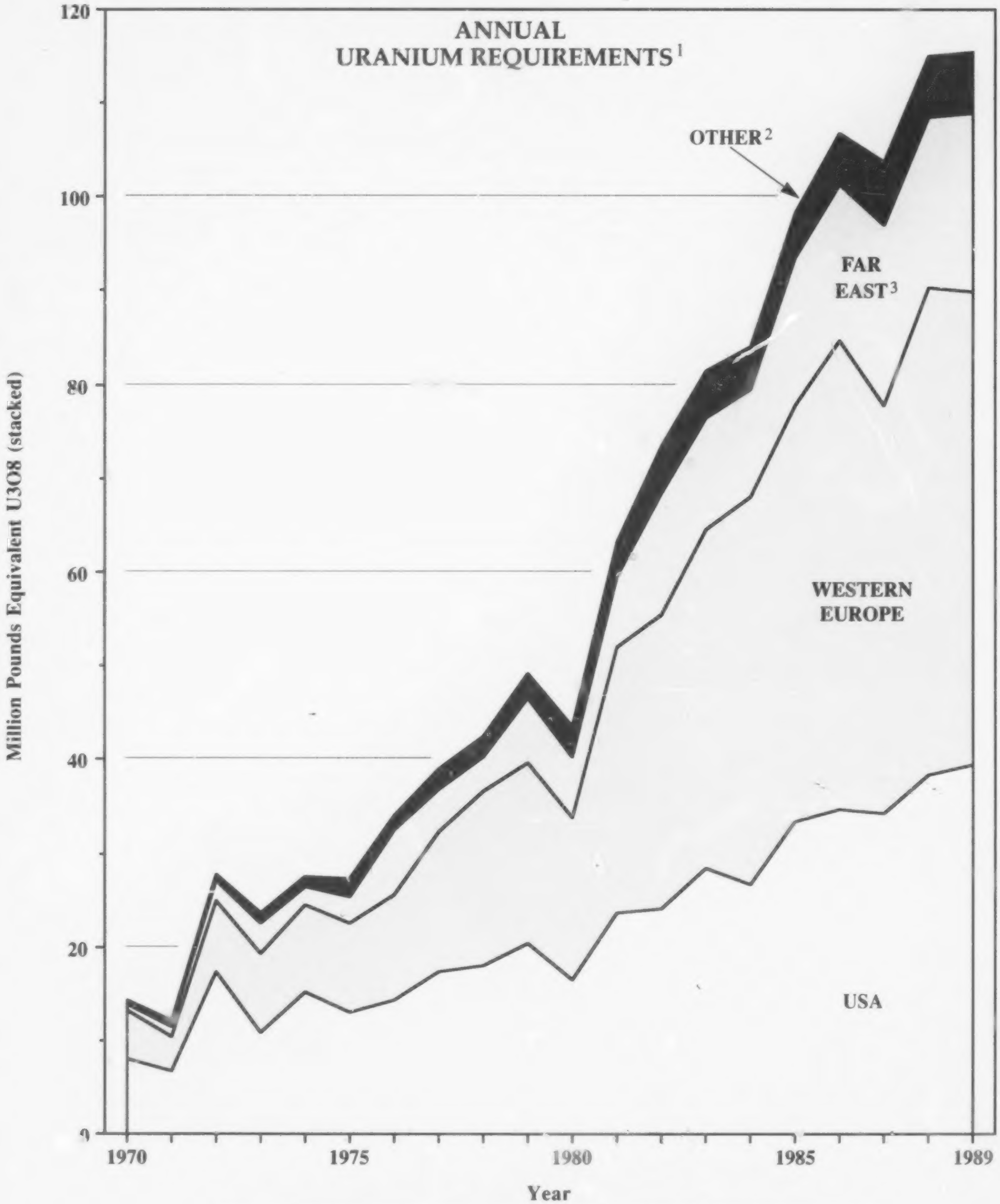

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.3
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.5
Apr	1990	—	119.9	—	128.7
May	1990	—	118.9	566.60	128.9
June	1990	207.4	116.6	—	129.5
July	1990	—	116.4	—	129.6
Aug	1990	—	122.4	574.10	129.7
Sept	1990	208.9	128.2	—	130.1
Oct	1990	—	134.1	—	130.2R
Nov	1990	214.5	133.7	589.20	130.1
Dec	1990	—	128.8	—	130.2
Jan	1991	—	125.6	—	130.1
Feb	1991	—	—	—	130.1

P = Preliminary   R = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	–.–	–.–	–.–	–.–	–.–
1981	Avg.	83.4	75.5	–.–	–.–	–.–	–.–	–.–
1982	Avg.	89.0	83.7	–.–	–.–	–.–	–.–	–.–
1983	Avg.	92.1	88.5	17.22	–.–	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	–.–	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.8 **R**	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6 **R**	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9 **R**	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	110.9 **R**	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79 **R**	21.79 **R**	19.78 **R**	14.66	15.89 **R**
Feb	1991	110.7 **R**	125.0	25.23 **P**	22.30 **P**	20.02 **P**	14.67 **P**	16.05 **P**
Mar	1991	110.3	125.5	–.–	–.–	–.–	–.–	–.–

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	660,151	942,831
Jan	1991	—	—	219.5	218.0	—	—
Feb	1991	—	—	222.2	219.3	—	—
Mar	1991	—	—	224.1	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5 **R**	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7 **R**	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	118.9	118.6	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	118.3	118.9	134.6	—	14.73 **R**	14.63 **R**	13.85 **R**	10.60
Feb	1991	117.2	117.2	134.8	—	14.77 **P**	14.58 **P**	13.82 **R**	10.60 **R**
Mar	1991	115.6	116.1	135.0	134.9	-·-	-·-	13.86 **P**	10.60 **P**

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] ($/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1989: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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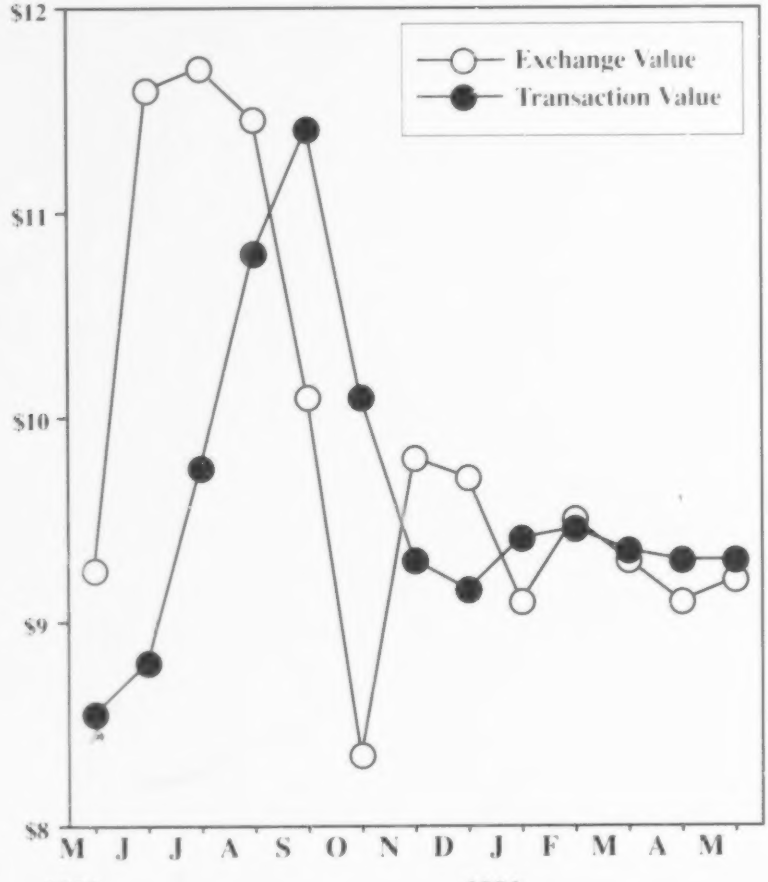

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To Our Readers

NUEXCO will be hosting a hospitality suite at the US Council for Energy Awarness International Enrichment Conference to be held June 23-26 in Washington, D.C. We look forward to seeing you there.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report May 31, 1991	Last Report April 30, 1991	12 Months Ago May 31, 1990
EXCHANGE VALUE[1]	**$9.20**/lb equivalent U_3O_8	$9.10	$9.25
UF_6 VALUE[2]	**$27.60**/kg U as UF_6	$27.25	$25.50
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**$1.50**/lb U as UF_6	$1.45	$1.45
SWU VALUE[5] (0.3 w/o tails assay)	**$54**/SWU	$52	$50
TRANSACTION VALUE[6]	**$9.30**/lb equivalent U_3O_8	$9.30	$8.55
Transactions	**21**	22	27
Months	**3**	3	3
Millions of Pounds	**5.3**	5.6	9.9

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Rate** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.

- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.

- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.

- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.

- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.

- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.

- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.

- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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MAY MARKET REVIEW

(as of May 31, 1991)

OVERVIEW

The uranium market strengthened slightly during the month of May, and the May 31 Exchange Value edged upward to $9.20 per pound U_3O_8. The UF_6 Value also increased, climbing to $27.60 per kgU as UF_6. Nine near-term uranium sales were reported for 1.7 million pounds equivalent U_3O_8. Seven sales involved concentrates and two involved UF_6; no enriched uranium product (EUP) sales were reported.

Year-to-date market volume now exceeds ten million pounds equivalent U_3O_8 (**Table 1**). Although the market strengthened somewhat during May, market volume decreased from April's level of 3.8 million pounds, as demand slackened.

The Loan Rate remained unchanged at 3.5 percent per annum. One loan for more than one million pounds equivalent U_3O_8 was reported. The Conversion Value moved up $0.05, to $1.50 per pound U as UF_6; one near-term and one long-term conversion transaction were reported.

The SWU Value increased two dollars, to $54 per SWU. Only one transaction for a small quantity of SWU was reported in the May enrichment market.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	May 1991		Year-to-Date	
	No. of Sales	Volume [1]	No. of Sales	Volume [1]
Concentrates	7	1.4	26	4.8
Natural UF_6	2	0.3	11	3.6
EUP	0	0.0	8	2.1
Total [2]	**9**	**1.7**	**45**	**10.5**

[1] million pounds equivalent U_3O_8

[2] columns may not total due to independent rounding

NATURAL URANIUM AND CONVERSION

The **Exchange Value** increased $0.10, to $**9.20** per pound U_3O_8. Uranium prices firmed through the middle of May as sellers increased their offering prices, but lost momentum during the final week of the month in the face of weakening demand. Abundant supply, particularly in the form of concentrates, also contributed to the month-end softness in the market. Also impacting the market was a widening gap between the prices offered by sellers and the prices discretionary buyers were willing to pay; this led some discretionary buyers to exit the market temporarily in the hope of lower prices in the future.

Seven near-term concentrates sales were reported, totalling over 1.4 million pounds equivalent U_3O_8. Utilities, intermediaries, and producers each made purchases. Unlike past months, when most transactions involved US entities, May's seven concentrates transactions involved participants from Asia, Australia, Europe, and North America.

* * *

The **UF_6 Value** also moved up slightly, registering a $0.35 increase, to $**27.60** per kgU as UF_6. UF_6 is now selling for $0.25 more than the sum of the values of its component parts—concentrates and conversion. Rather than an indication of a premium for UF_6, the differential reflects a small discount for concentrates due to their abundance in the market, and also the increasing price of conversion services. Only two natural UF_6 sales were reported; US intermediaries sold over 250 thousand pounds equivalent U_3O_8.

* * *

In the long-term uranium market, three sales were reported. Asian and US buyers purchased a total of two million pounds equivalent U_3O_8 in the form of concentrates, for delivery during the period 1991-1996.

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The **Transaction Value** was unchanged at **$9.30** per pound U_3O_8, based on 21 transactions over 3 months involving 5.3 million pounds equivalent U_3O_8.

* * *

Active uranium supply increased by over one million pounds, to **7.1** million pounds equivalent U_3O_8. **Active uranium demand** decreased slightly, dropping 55 thousand pounds, to **1.4** million pounds equivalent U_3O_8 (**Table 2**). The new **supply-demand ratio** is **5.1**.

* * *

The **Loan Rate** remained at **3.5** percent per annum. Only one loan was reported in May, in which an intermediary borrowed over one million pounds of concentrates.

* * *

The **Conversion Value** climbed $0.05, to **$1.50** per pound U as UF_6. This is the first change in the Conversion Value in 14 months, and ends its longest unchanged streak since the Conversion Value was first published in 1981. The strengthening is a result of reduced competition among conversion sellers recently, and the fact that UF_6 supplies overhanging the market have diminished. One near-term conversion sale was reported, in which an intermediary purchased a moderate quantity of conversion services at a price near the May 31, 1991 Conversion Value. In addition, one long-term conversion sale was reported, as a US utility purchased over 1.5 million pounds U for delivery during 1993-1997.

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The enrichment market strengthened during May, consequently, the **SWU Value** rose two dollars, to **$54** per SWU. Several factors prompted the price rise, including less aggressive sellers, more discretionary buyers, and the fact that enrichment supplies generally are located in Europe, while most uncovered demand is in the USA. Near-term competition was less aggressive among sellers, in particular traders, as readily available near-term SWU supply has tightened in recent months. Only one near-term transaction was reported in May, in which a US utility purchased a small quantity of SWU for delivery during first quarter 1992.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	7,130	1,400
• Supply/Demand Ratio:	5.1	
• Loan (thousand lbs equivalent U_3O_8)	5,900	0
• Conversion (thousand lbs U as UF_6)	700	0
• SWU (thousand SWUs)	380	175

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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A number of buyers entered the long-term SWU market during May, and at month end, at least ten US utilities were evaluating long-term SWU offers. Many of these potential buyers entered the market to evaluate alternative sources of SWU supply in light of DOE's recent marketing efforts, which have tended to focus on those customers who are currently 70 percent committed during the 1996-1998 time period.

Table 3
ENRICHMENT PRICES
(May 31, 1991)

Prices	This Month Report 274	Last Month Report 273	12 Months Ago Report 262
NUEXCO SWU Value ($US per SWU)	54	52	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[2]	153.00[2]	153.00[2]
Requirements	157.00[2]	157.00[2]	157.00[2]
Incentive Price (IP2)[3]	100.60[3]	100.60[3]	90.00[4]
Calculated worth of enriched UF_6[5]: ($US per KgU as UF_6)			
2.0 $^{w}/_{o}$ U^{235}	205	200	198
2.5 $^{w}/_{o}$ U^{235}	284	276	273
3.0 $^{w}/_{o}$ U^{235}	365	355	351
3.5 $^{w}/_{o}$ U^{235}	447	436	430
4.0 $^{w}/_{o}$ U^{235}	531	517	510
4.5 $^{w}/_{o}$ U^{235}	616	600	591

[1] Effective 10/1/89 to 9/30/91.
[2] Effective since 10/1/84.
[3] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[4] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[5] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^{w}/_{o}$ U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5108	1995	301-600	R	Intermediary	Intermediary	
5109	1995	301-600	R	Utility	Intermediary	
5110	1991-1996	1,001-3,000	See Remarks	Utility	Producer	Price Related to Market
5111	1991	301-600	See Remarks	Producer	Producer	Price Related to Market
5114	1991	50-100	98-102	Intermediary	Producer	
5115	1991	101-300	98-102	Utility	R	
5118	1991	Less than 50	98-102	Producer	Producer	
5121	1991	101-300	98-102	Utility	Intermediary	UF_6
5122	1991	50-100	98-102	Utility	R	
5123	1991	301-600	R	Intermediary	Producer	
5124	1991	101-300	98-102	Intermediary	Intermediary	UF_6
5127	1991	50-100	98-102	Producer	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5120	1991	1,001-3,000	Above 110	Intermediary	**R**	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks
5113	1993-1997	1,001-3,000	**R**	Utility	Convertor	
5117	1991	101-300	98-102	Intermediary	Convertor	

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5126	1992	50-100	103-110	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078A	700	1,045 per year	1991-1993	UF_6e
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1501	3,000	1,000 per year	1991-1995	U_3O_8/UF_6
91-1060	100	—	1991	
91-1502	500	—	1991	
91-1503A*	1,330	2,670	1991-1993	UF_6e
91-1505*	500	—	1991	
TOTAL	**7,130**			
INACTIVE	**3,600**			
AVAILABLE FOR LOAN:				
ACTIVE				
90-1230	1,000	—	—	U_3O_8
91-1034	1,000	—	—	U_3O_8
91-1084	3,900	—	—	U_3O_8
TOTAL	**5,900**			
INACTIVE	**1,000**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1016, 91-1504

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SUPPLY AND DEMAND

Uranium Demand

	Quantity (Thousand Pounds equivalent U_3O_8)			
NUEXCO Project Number	**Spot or Near-term[1]**	**Intermediate or Long-term[2]**	**Delivery Period**	**Remarks**
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100A	45	—	1991	UF_6e
90-1224A	300	11,700	1991-2001	U_3O_8/UF_6/UF_6e
91-1010A	85	—	1991	UF_6e
91-1106*	405	—	1991	
91-1112*	160	—	1991-1992	U_3O_8/UF_6
91-1122*	15	—	1991	
91-1127A*	390	—	1992	UF_6e
90-1291	—	100 per year	1991-1995	
91-1014A	—	6,800	1992-2001	UF_6e
91-1017	—	300 per year	1995-2000	
91-1054	—	1,200	1992-1997	
91-1064	—	230 per year	1993-1997	U_3O_8/UF_6
91-1093	—	200 per year	1994-1996	
91-1094A	—	1,700 per year	1994-1995	UF_6e
91-1102*	—	1,000 per year	1992-1995	U_3O_8/UF_6
91-1108*	—	400 per year	1993-1997	U_3O_8/UF_6
91-1110*	—	90	1992	UF_6
91-1115*	—	250 per year	1992-1994	
91-1118*	—	300 per year	1993-1998	U_3O_8/UF_6
TOTAL	**1,400**			
INACTIVE	**1,400**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

---

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*

Active Projects removed since last month: 91-1076A, 91-1100, 91-1101

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6) Within 3 Years[1]	Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	300	—	1991	
91-1501	400	—	1991	
Total	**700**			
INACTIVE	*None reported*	—		

INQUIRIES TO PURCHASE: *No inquiries to purchase are reported*

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1085

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE FOR SALE:				
ACTIVE				
90-1078B	200	435 per year	1991-1993	UF_6e
91-1008*	130	—	1991	
91-1032*	50	—	1991	
90-1500	—	1,000	1991 on	
Total	**380**			
INACTIVE	**1,000**			
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1100B	15	—	1991	UF_6e
91-1010B	20	—	1991	UF_6e
91-1127B*	90	—	1992	UF_6e
91-1128*	50	—	1991	
90-1181	—	1,500	1996-2001	
90-1196	—	60 per year	1995 on	
90-1224B*	—	1,920	1991-2001	UF_6e
90-1301	—	1,000 per year	1995-2000	UF_6e
91-1014B	—	1,770	1992-2001	UF_6e
91-1027	—	55 per year	1996-2000	
91-1063	—	15 per year	1995-1998	
91-1066	—	320	1995-2000	
91-1083	—	150 per year	1996-1998	
91-1094B	—	385 per year	1994-1995	UF_6e
91-1105*	—	205	1996-2001	
91-1109*	—	150 per year	1992-1996	
91-1113*	—	710	1996-2000	
91-1120*	—	120	1996-1999	
91-1121*	—	50	1996-1998	
Total	**175**			
INACTIVE	**180**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1069
Active Projects removed since last month: 90-1028, 91-1055

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MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	This Month (May 31, 1991)	Last Month (Apr. 30, 1991)	12 Months Ago (May 31, 1990)	This Month (May 31, 1991)	Last Month (Apr. 30, 1991)	12 Months Ago (May 31, 1990)
Australia (dollar)	12.09	11.64	11.98	31.43	30.25	31.14
Belgium (franc)	329.63	319.07	320.18	856.97	829.52	832.40
Canada (dollar)	10.53	10.49	10.88	27.38	27.28	28.28
EC (ecu)	7.72	7.65	7.54	20.06	19.89	19.59
Finland (markka)	38.11	36.30	36.40	99.07	94.36	94.63
France (franc)	54.40	52.52	52.50	141.43	136.54	136.48
Germany (mark)	16.03	15.55	15.57	41.66	40.42	40.47
Italy (lira)	11,891	11,480	11,451	30,914	29,845	29,770
Japan (yen)	1,272	1,239	1,400	3,307	3,222	3,641
Netherlands (guilder)	18.06	17.49	17.52	46.96	45.46	45.55
So. Africa (comm. rand)	25.92	25.36	24.54	67.37	65.92	63.79
So. Korea (won)	6,664	6,604	6,493	17,326	17,170	16,879
Spain (peseta)	992.23	957.29	965.65	2,580	2,489	2,510
Sweden (krona)	57.46	55.73	56.20	149.39	144.87	146.10
Switzerland (franc)	13.65	13.13	13.17	35.48	34.13	34.23
Taiwan (dollar)	247.48	244.79	253.45	643.39	636.39	658.92
UK (pound)	5.42	5.26	5.45	14.09	13.67	14.18
US (dollar)	9.20	9.10	9.25	23.92	23.66	24.05

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	This Month (May 31, 1991)	Last Month (Apr. 30, 1991)	12 Months Ago (May 31, 1990)	This Month (May 31, 1991)	Last Month (Apr. 30, 1991)	12 Months Ago (May 31, 1990)
Australia (dollar)	12.22	11.89	11.07	31.77	30.92	28.79
Belgium (franc)	333.21	326.09	295.95	866.28	847.75	769.40
Canada (dollar)	10.64	10.72	10.06	27.67	27.88	26.14
EC (ecu)	7.80	7.82	6.96	20.28	20.32	18.11
Finland (markka)	38.52	37.09	33.64	100.14	96.43	87.47
France (franc)	54.99	53.67	48.52	142.96	139.54	126.15
Germany (mark)	16.20	15.89	14.39	42.11	41.31	37.41
Italy (lira)	12,020	11,732	10,584	31,250	30,501	27,517
Japan (yen)	1,286	1,267	1,294	3,343	3,293	3,365
Netherlands (guilder)	18.26	17.87	16.20	47.47	46.46	42.11
So. Africa (comm. rand)	26.20	25.91	22.68	68.11	67.37	58.96
So. Korea (won)	6,737	6,749	6,001	17,514	17,547	15,602
Spain (peseta)	1,003	978.33	892.58	2,608	2,543	2,321
Sweden (krona)	58.09	56.95	51.94	151.02	148.06	135.04
Switzerland (franc)	13.80	13.42	12.17	35.87	34.88	31.64
Taiwan (dollar)	250.17	250.17	234.27	650.38	650.38	609.06
UK (pound)	5.48	5.37	5.04	14.24	13.97	13.11
US (dollar)	9.30	9.30	8.55	24.18	24.18	22.23

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[1] As of May 1991 Report #273; calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* on the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6 This Month (May 31, 1991)	per lb U as UF_6 Last Month (Apr. 30, 1991)	per lb U as UF_6 12 Months Ago (May 31, 1990)	per kg U as UF_6 This Month (May 31, 1991)	per kg U as UF_6 Last Month (Apr. 30, 1991)	per kg U as UF_6 12 Months Ago (May 31, 1990)
Australia (dollar)	1.97	1.85	1.88	4.35	4.09	4.14
Belgium (franc)	53.74	50.84	50.19	118.49	112.09	110.65
Canada (dollar)	1.72	1.67	1.71	3.78	3.69	3.76
EC (ecu)	1.26	1.22	1.18	2.77	2.69	2.60
Finland (markka)	6.21	5.78	5.71	13.70	12.75	12.58
France (franc)	8.87	8.37	8.23	19.55	18.45	18.14
Germany (mark)	2.61	2.48	2.44	5.76	5.46	5.38
Italy (lira)	1,939	1,829	1,795	4,274	4,033	3,957
Japan (yen)	207.38	197.49	219.53	457.20	435.40	483.98
Netherlands (guilder)	2.95	2.79	2.75	6.49	6.14	6.06
So. Africa (comm. rand)	4.23	4.04	3.85	9.32	8.91	8.48
So. Korea (won)	1,087	1,052	1,018	2,395	2,320	2,244
Spain (peseta)	161.78	152.54	151.37	356.66	336.28	333.72
Sweden (krona)	9.37	8.88	8.81	20.66	19.58	19.42
Switzerland (franc)	2.23	2.09	2.06	4.91	4.61	4.55
Taiwan (dollar)	40.35	39.00	39.73	88.96	85.99	87.59
UK (pound)	0.88	0.84	0.85	1.95	1.85	1.88
US (dollar)	1.50	1.45	1.45	3.31	3.20	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (May 31, 1991)	SWU Value at 0.30 w/o Tails Assay Last Month (Apr. 30, 1991)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (May 31, 1990)	UF_6 Value per kg U as UF_6 This Month (May 31, 1991)	UF_6 Value per kg U as UF_6 Last Month (Apr. 30, 1991)	UF_6 Value per kg U as UF_6 12 Months Ago (May 31, 1990)
Australia (dollar)	70.96	66.50	64.75	36.27	34.85	33.02
Belgium (franc)	1,935	1,823	1,731	988.89	955.47	882.66
Canada (dollar)	61.81	59.96	58.80	31.59	31.42	29.99
EC (ecu)	45.28	43.71	40.73	23.15	22.91	20.77
Finland (markka)	223.49	207.40	196.75	114.32	108.69	100.34
France (franc)	319.30	300.11	283.77	163.20	157.27	144.72
Germany (mark)	94.06	88.84	84.15	48.08	46.56	42.91
Italy (lira)	69,794	65,599	61,897	35,673	34,376	31,567
Japan (yen)	7,466	7,083	7,570	3,816	3,712	3,861
Netherlands (guilder)	106.03	99.92	94.71	54.19	52.36	48.30
So. Africa (comm. rand)	152.11	144.89	132.63	77.75	75.93	67.64
So. Korea (won)	39,116	37,739	35,095	19,993	19,776	17,899
Spain (peseta)	5,824	5,470	5,220	2,977	2,867	2,662
Sweden (krona)	337.29	318.43	303.77	172.39	166.87	154.92
Switzerland (franc)	80.11	75.01	71.17	40.94	39.31	36.30
Taiwan (dollar)	1,453	1,399	1,370	742.43	733.02	698.71
UK (pound)	31.80	30.04	29.48	16.25	15.74	15.04
US (dollar)	54.00	52.00	50.00	27.60	27.25	25.50

[1] As of May 1991 Report #273: calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* on the last business day of the month.

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RECENT DEVELOPMENTS

On June 6, 1991, CONCORD/NUEXCO issued the following press release regarding a new joint venture with v/o Techsnabexport of the Soviet Union. The following is a reprint of that press release.

CONCORD, a group of companies owned by Oren L. Benton, a Denver-based businessman, and v/o Techsnabexport (TENEX) of the Soviet Union, have announced that they have formed a joint venture to market certain products and services of the Ministry of Atomic Energy and Industry (MAEI) of the Soviet Union, including all nuclear fuel products and services. The joint venture, to be called Global Nuclear Services and Supply, Ltd. (GNSS), will have offices in Moscow, Zurich, and Washington, DC later this year. GNSS will concentrate on securing long-term uranium and enrichment services supply contracts with utilities, principally in the United States and the Far East, although generally operating worldwide.

TENEX is a foreign trade association of the MAEI, the largest Ministry of the Soviet Union. TENEX has exclusive rights to market various products of the MAEI enterprises, including uranium and enrichment services. The enterprises have the capability to supply a significant percentage of the world's commercial nuclear power fuel requirements annually. TENEX is headquartered in Moscow and has been active in the supply of nuclear fuel on a worldwide basis for many years.

CONCORD has interests in mining, microchip development, banking and other industries including NUEXCO, the world's largest nuclear fuel trading organization. Recently, CONCORD announced formation of a joint venture with respect to the operations of Energy Fuels, a major US uranium producer based in Denver with mining and milling operations primarily in Arizona and Utah.

Speaking on behalf of GNSS, Mr. Benton and Mr. A. A. Shishkin, General Director of TENEX, said:

> GNSS's primary objective will be to provide the nuclear electric utility industry with a reliable, flexible, and economic long-term supply of nuclear fuel. Abundant uranium deposits, combined with advanced technology in uranium processing, put GNSS in a position to compete worldwide as a low-cost producer. With access to the broad market knowledge and marketing expertise of NUEXCO, we believe GNSS can achieve its objective of establishing itself as one of the world's most reliable and efficient nuclear fuel suppliers. Also, through this arrangement and other active joint ventures CONCORD has with the MAEI in marketing other MAEI enterprises' products, we anticipate that substantial investments will be made by TENEX and the MAEI in the purchase of industrial and consumer goods produced in the West consistent with the United States' stated intention to expand Soviet-US trade and investment.

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WASHINGTON FOCUS

by Linda L. Gunter

Congress continued its rapid pace on enactment of energy policy legislation; the House passed the Energy & Water Appropriations bill, while the Senate Energy & Natural Resources Committee concluded markup of National Energy Strategy legislation. In June, the Senate probably will bring to the floor for passage the Uranium Enrichment Act of 1991 (S 210). Additionally, the industry held a successful Nuclear Power Assembly, May 13-15. President Bush wrote to the assembly complementing the industry on its Strategic Plan for Building New Nuclear Plants. The President said, "Implementing the National Energy Strategy is essential, not only to our national security, but also to our economic productivity and competitiveness. This strategy calls for developing more economical, safer nuclear technologies."

Nuclear Power Assembly

◇ The 1991 Nuclear Power Assembly attracted the largest crowd ever, to hear an optimistic assessment of the industry's future. Debate on the National Energy Strategy has given the industry visibility, and the Clean Air Act's strict emission standards will make nuclear power an option for the future. There is consensus, both within Congress and the industry, that there are three issues to be resolved before nuclear energy will be considered a viable option for US electrical generation: reform of Nuclear Regulatory Commission (NRC) licensing procedures for reactors; standardized advanced designs certified by the NRC; and resolution of the spent fuel repository problem. The industry hopes public support for nuclear power generation will grow as the need for more electricity becomes apparent, and as global warming and clean air requirements restrict utilities' options for new power supply.

Sen. Malcolm Wallop (R-WY) presented the keynote address to the Assembly. He noted that the USA has become dependent upon foreign energy sources, as indicated by the fact that half of our trade deficit is caused by imports of energy. He also commented on the status of the omnibus energy bill (S 341) he and Sen. Johnston sponsored: the committee finished markup May 23 and he is relatively confident the bill will be passed by the Senate. The most controversial issue of the bill is Sen. Wallop's amendment on licensing reform, which codifies the NRC's intentions to hold one public hearing prior to construction. The amendment would allow a plant to operate once it is built, as long as no significant design changes or safety issues arise during construction.

The Assembly's first panel of speakers included representatives from private industry, as well as the US Department of Energy (DOE) and the Council on Environmental Quality (CEQ). The panel talked about how the passage of the Clean Air Act can be used to promote nuclear as a viable energy alternative. Lucinda Swartz of the CEQ called upon the industry to use the National Environmental Policy Act (NEPA) to involve the public in the debate about nuclear power. NEPA requires the development of an Environmental Impact Statement (EIS) on all major federal policy decisions. The completion of an EIS requires public hearings, thereby involving the public prior to construction, informing them about new nuclear plant designs, safety standards, and costs.

A second panel discussed obstacles to nuclear's renaissance. Rep. Jay Rhodes (R-AZ) noted that industry can expect the same problems with siting the civilian spent fuel repository at Yucca Mountain, as DOE is experiencing in getting the Waste Isolation Pilot Plant operating. Rep. Bob Clement (D-TN) spoke about his bill, HR 1184, concerning nuclear licensing reform and standardization of designs. Dr. Andrew Kadak, President and CEO of Yankee Atomic, concluded the panel with

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a discussion of license renewal. He noted that anti-nuclear groups have selected the license renewal issue as the next big issue in their drive to stop nuclear power. Kadak urged industry to make the point that extending the operating life of existing plants, through license renewal, is the least expensive, most efficient method to maintain needed power supplies. Industry must be successful on this issue or older plants will begin shutting down in nine years.

DOE Deputy Secretary, W. Henson Moore, gave the luncheon address. He hailed the Senate Energy & Natural Resources Committee vote on Sen. Malcolm Wallop's licensing reform amendment as a major victory for the industry, and said "the National Energy Strategy is incomplete without it." Moore emphasized that industry needs to continue to educate the entire Senate about the issue, and in particular, dispel the misconception that the amendment takes the public out of the process, when in fact, it ensures that everyone has an opportunity to participate in the licensing process, before a major investment is made in construction.

DOE FY 1992 Budget

◇ Congress made progress during May on DOE's FY 1992 budget request. The House Science, Space & Technology (SST) Committee marked up the authorizing bill for the Atomic Vapor Laser Isotope Separation (AVLIS) program and other nuclear research programs. On May 29, the House passed the Energy & Water Appropriations bill, cutting DOE's request for uranium enrichment by $209 million. The AVLIS program was cut by $50 million, and $159 million that DOE had set aside as a working capital fund for the government corporation was removed. The appropriations committee report expressed concern about the Administration's decision to eliminate funding of predeployment activities for AVLIS, but to increase the R&D money. It stated, "In view of the reduced level of support for this process, there is no evident reason to expedite the research and development." The committee did not authorize DOE to purchase enrichment services, but instead deferred the decision until a government corporation is established.

Programs have funding levels set by authorizing committees, but the actual budget is determined by the appropriations committee. Congress has not passed authorization for DOE's AVLIS program since FY 1988, leaving the amount and allocation solely to the appropriations committees. This year, the authorizing committee (SST) increased the budget for AVLIS and required DOE to pursue predeployment activities such as selection of a Commercial Deployment Contractor. If the authorizing committee's legislation becomes law, some type of reconciliation will have to be worked out, because of conflict with the appropriations committee's actions reducing the budget for AVLIS.

Because of last year's budget agreement, funding for all FY 1992 programs is under close scrutiny, and with congressmen trying to find money for their own programs, DOE's AVLIS program could be harmed. Since the House has voted, the last chance for full funding of the AVLIS program will be the Senate appropriations bill, to be considered in June.

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INDUSTRY BRIEFS

TEPCO Reactor Plans Receive Approval

On May 15, 1991, Minister Nakao of the Ministry of International Trade and Industry, in conjunction with the Science and Technology Agency, approved construction permits for Tokyo Electric Power Company's (TEPCO) Kashiwazaki-Kariwa units 6 and 7. These are the final regulatory permits TEPCO needed before initiating construction of the two units. Construction of the sixth unit is scheduled to start later this year—the unit should reach commercial operation in mid-1996. Unit seven's construction should start in early 1992, and commercial operation should commence in mid-1997.

◆ ◆ ◆

India Selects Site For New 4,000 MWe Station

India's Atomic Energy Commission has selected Trikkareppur in the state of Kerala (on India's southwest coast) as the site for a proposed nuclear station. When completed, the station will include eight 500-MWe units, making it the largest station in the country. Initial power generation from the first phase of four 500-MWe units should occur in 1997.

This new station is one of the projects resulting from the nuclear cooperation agreement between India and the Soviet Union.

Spain's New Energy Plan To Continue Nuclear Moratorium

Spain's ruling Socialist party recently announced through Energy and Industry Minister, Claudio Aranzadi, that Spain's new National Energy Plan will not permit the operation of any new nuclear plants before the year 2000, and instead, will depend upon natural gas to meet the country's growing electricity demand. Nuclear proponents had hoped that the new energy plan would end the nuclear moratorium, first imposed in 1984. With this announcement, utilities are again considering cancellation of the incompleted reactors at Valdecabelleros and Lemoniz, rather than continuing their maintainence in a mothballed condition. Any governmental decision regarding the fate of the reactors has yet to be announced.

◆ ◆ ◆

Japan's 41st Reactor Begins Commercial Operation

On April 12, Tomari 2, a 550-MWe (net) PWR, began commercial operation. It is Hokkaido Electric Power Company's second nuclear reactor and is Japan's forty-first reactor to have reached commercial operation. Tomari 2 has been in pre-commercial testing since June 1990. The reactor's capacity raises Japan's total nuclear power capacity to 30,860 MWe (net).

General Atomics Agrees to Buy Chevron Uranium Properties

On June 4, General Atomics (GA) based in San Diego, California and Chevron Resources Company, a unit of Chevron Corporation of San Francisco, California, announced they had reached a definitive agreement whereby GA will purchase all of Chevron's uranium assets in the USA and Canada. These assets include the Panna Maria uranium mill, a 55-percent share of the Rhode Ranch uranium mine in south Texas, the Mt. Taylor uranium mine in New Mexico (the largest uranium deposit in the USA), and exploration properties in Saskatchewan, Canada. Terms of the agreement were not released.

◆ ◆ ◆

Rio Algom Ltd. and Uranium Resources, Inc. Agree To Merge

In late May, Rio Algom, Ltd. (RAL) and Uranium Resources, Inc. (URI) agreed to a merger in which Rio Algom Mining Corporation (which is owned by RAL) will acquire all outstanding URI shares. Rio Algom presently owns eight percent of URI shares. Rio Algom likely will benefit from the acquisition of URI's current contracts and its technical expertise, particularly with respect to in-situ leach mining. The transaction probably will be concluded by the third quarter of 1991.

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URANIUM INDUSTRY OF THE PEOPLE'S REPUBLIC OF CHINA

China has a well-developed uranium industry capable of supporting the nation's ambitious domestic nuclear program. China's geology is diverse and offers a good potential for uranium deposits. A large number of deposits have been found to date; most are small and of low to moderate grade, but the combined production capability is substantial. China is the world's third largest country, with an area of approximately 9.6 million square kilometers (3.7 million square miles), which is almost as large as Canada, and slightly larger than the USA.

Currently, China has several nuclear power plants under construction and an aggressive plan for building future reactors, but no reactors have yet reached commercial operation. For this reason, China can make available for export to the world market about three million pounds equivalent U_3O_8 annually.

Background

The government-owned China National Nuclear Corporation (CNNC), which reports to the Council of State, is responsible for all aspects of the nuclear industry in China. CNNC was founded on September 16, 1988 and is the successor to the Ministry of Nuclear Industry.

CNNC incorporates over 200 enterprises, companies, and institutions employing a total of about 300 thousand people, 70 thousand of whom are scientists and engineers. CNNC constructs and operates nuclear power plants, maintains research facilities, and designs and produces instruments and machinery not only for the nuclear industry, but also for electrical and metallurgical enterprises. A special branch is dedicated to safety, and environmental and health protection. China Nuclear Energy Industry Corporation (CNEIC), the firm responsible for the marketing and export of Chinese uranium around the world, is a branch of CNNC.

Two branches of CNNC, the Bureau of Uranium Mining and Metallurgy (BMM) and the Bureau of Geology (BG), control uranium exploration and mining. The principal duty of BG is the discovery of uranium resources that are sufficient to fuel China's present and future nuclear power plants. BG and its predecessors started exploration for uranium in 1955, initially with assistance and supervision of Soviet experts. More than 200 deposits and major occurrences of uranium have been discovered.

Since 1979, BG also has explored for rare earth elements, precious metals, and potassium deposits. In addition to exploration, BG offers consulting and contract services for ore reserve calculations, engineering geology, environmental geology, and exploration for oil and other commodities (**Table 1**). The bureau employs more than 60 thousand people who are directed from six regional offices:

- Changsha, Hunan province.
- Guangyuan, Sichuan province.
- Nanchang, Jiangxi province.
- Shaoguan, Guangdong province.
- Shenyang, Liaoning province.
- Xi'an, Shaanxi province.

Table 1
Other Facilities Controlled by CNNC's Bureau of Geology

- Beijing Research Institute for Uranium Geology
- East China Geological College in Fuzhou, Jiangxi
- Geological Secondary School and Technical Secondary School (training centers)
- Center for Airborne Surveys and Remote Sensing
- A production plant for survey instruments
- A production plant for synthetic diamonds

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Uranium Provinces and Regions

China has several key uranium regions which are located throughout the country (**Figure 1**). In order of importance to current uranium production, these production centers include:

1. Southeast China uranium region (Zhejiang, Jiangxi, Hunan, Guangdong, and Guangxi provinces).
2. Jingnan uranium region in southern China (Guangxi province).
3. Yin Shan–Liaohe uranium region in NE China (Liaoning and northern Hebei provinces).
4. Qilian–Qinling uranium region in central China (Gansu, Shaanxi, Henan, and Hubei provinces).
5. Zhungel–Tian Shan uranium region in NW China (in the Junggar Basin of Xinjiang province).
6. West Yunnan uranium region in SW China (Yunnan province).
7. Southwest Guizhou uranium region (Guizhou province).

The Southeast China uranium region is the most important uranium region presently, but more recent discoveries in the Yin Shan, Qilian, and Zhungel uranium regions may increase the significance of these production centers in the future.

Types of Uranium Deposits

The four prevailing types of uranium deposits in China containing economically viable uranium resources are:

- Granite-related deposits.
- Volcanic-related deposits.
- Sandstone-type deposits.
- Strata-structure-type deposits.

Other types of deposits of economic interest include metasomatic, intrusive (alkaline syenite, pegmatitic granite), silicic breccia, lignite, phosphorite, and carbonate-hosted mineralization. Strata-structure types of uranium deposits are defined as stratabound, structure-controlled uranium mineralization, which is primarily of a disseminated replacement nature. This mineralization is confined to altered fracture zones in distinct sedimentary or slightly metamorphosed sedimentary lithologies composed of primarily siliceous carbonate or pelite-dominated facies enriched in carbonaceous matter. Deposits of this type are termed by Chinese geoscientists as carbonate-siliceous-pelite type deposits.

Legend to Figure 1

Uranium Regions

Z-TS — Zhungel–Tian Shan uranium region
YS-L — Yin Shan–Liaohe uranium region
Q-Q — Qilian–Qinling uranium region
WY — West Yunnan uranium region
J — Jingnan uranium region
SG — Southwest Guizhou uranium region
SC — Southeast China uranium region (see detail in figure 2)

Uranium Mills

▮A — Hengyang
▮B — Zhuzhou
▮C — Shao Kuan
▮D — Hengjian
▮E — Guizhou
▮F — Huxian
▮G — Lianshanguan
▮H — Ürümqi

Uranium Deposits

● — designates granite-related deposit
◆ — designates sandstone deposit
◗ — designates metasomatite deposit
▲ — designates volcanic deposit
✖ — designates strata-structure deposit
■ — designates intrusive-type deposit

▲ 1 — Balyanghe deposit
◆ 2 — Mengqiguer deposit
◆ 3 — Daladi deposit
◆ 4 — Kashi Depression
◗ 5 — Lianshanguan area
■ 6 — Saima deposit
◆ 7 — Jianchang area
▲ 8 — Qinlong–Daxing'anling volcanic belt
◆ 9 — Langshan deposit
■ 10 — East & West Longshoushan belts
◗ 11 — North Qinlian belt
✖ 12 — So. Qinling area (Norgai deposit)
● 13 — Xi'an area
■ 14 — Danfeng-Zhuyangguan-Shangnan area
◆ 15 — Wudang–Huaiyong Massif
◆ 16 — So. Lancang (Mekong) River area
◆ 17 — Gaoligong area
◆ 18 — Tunling deposit
✖ 19 — Chienxinan deposit

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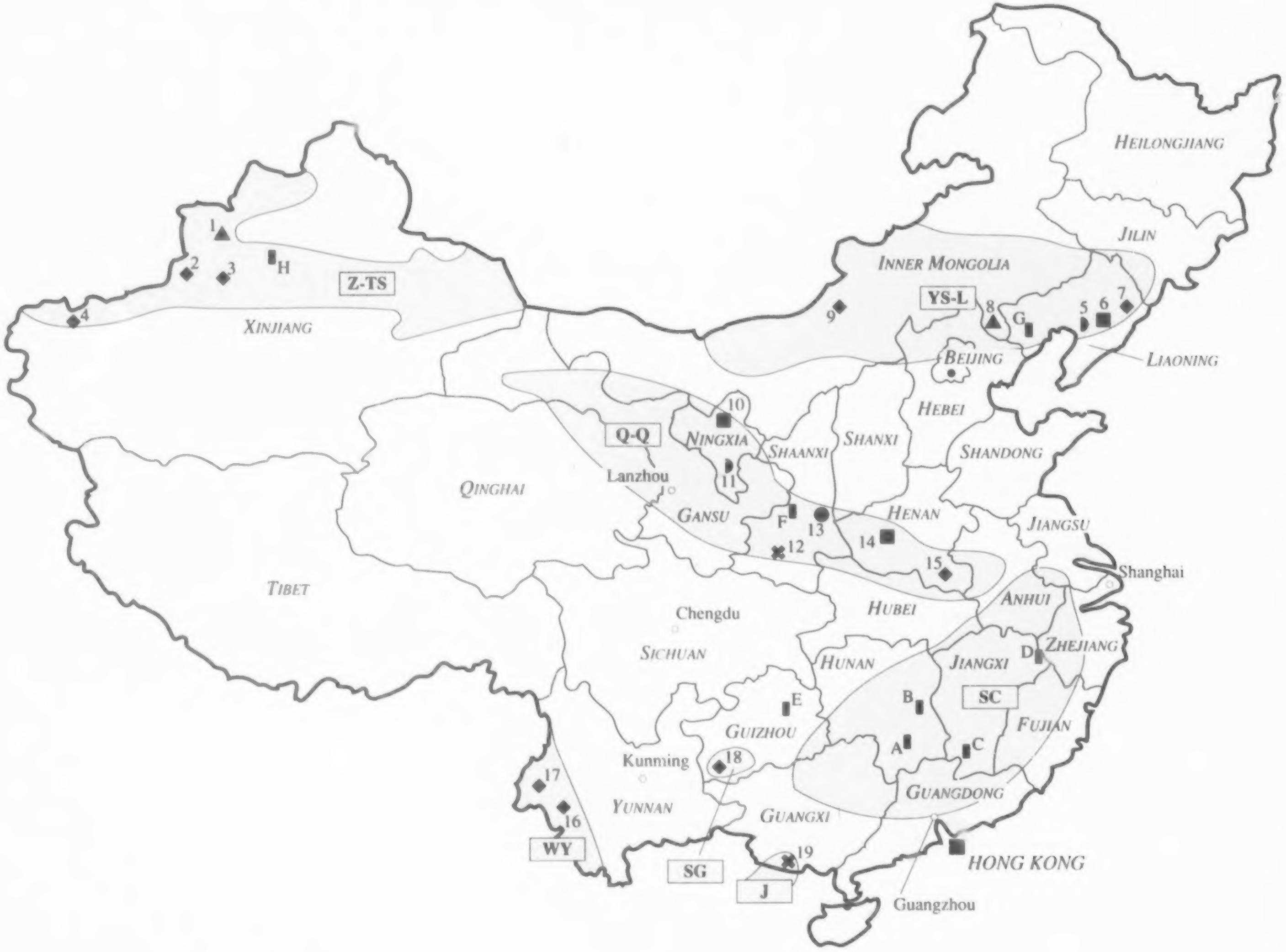
Figure 1
URANIUM REGIONS, DEPOSITS, AND MILLS OF CHINA


HEILONGJIANG
JILIN
INNER MONGOLIA
YS-L
LIAONING
BEIJING
HEBEI
SHANDONG
SHANXI
SHAANXI
NINGXIA
Q-Q
Lanzhou
GANSU
HENAN
JIANGSU
Shanghai
ANHUI
HUBEI
ZHEJIANG
JIANGXI
SC
FUJIAN
HUNAN
GUANGDONG
HONG KONG
Guangzhou
GUANGXI
GUIZHOU
SICHUAN
Chengdu
YUNNAN
Kunming
QINGHAI
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Granite-related deposits (intragranitic and perigranitic veins) are particularly abundant in the central (Nanling) metallogenetic zone of the Southeast China uranium region. Some minor deposits or occurrences also have been identified in the Xi'an area of Shaanxi province, the North Qinling fold belt in central China, and the Lower Yangzi granite belt in the Jiangsu province in the southeast.

Volcanic-related deposits (vein and stratiform) are prominent in the eastern (Zhejiang-Fujian) metallogenetic zone in Southeast China, particularly in the Gan-Hang volcanic belt, and less prominently in the south Jiangxi-north Guangdong volcanic-granite belt. Other locations with volcanic deposits include the Zhungel-Tian Shan region, and the Daxing'anling-Yanshan volcanic belt of the Qinglong region in Northeast China.

Sandstone-type deposits are reported from the Illi Basin and Kashi Depression in Northwest China; the Jianchang, Qinglong and Langshan areas in Northeast China; the North Qilian fold belt and Wudang-Huaiyang Medium Massif/North Qinling fold belt in central China; Baoshan Medium Massif in western Yunnan province; Jingnan Block in southern China; and Pukuitang in Southeast China.

Strata-structure types of deposits are distributed in the western (Guangxi, Hunan, Jiuling, Jiangxi and Xuefeng) metallogenetic zone of Southeast China, the Southwest Guizhou region, the Zhungel-Tian Shan uranium region, and the Beilungjiang anticlinorium/south Qinling fold belt of central China.

Metasomatic-type deposits have been identified from Lianshanguan/Liaodong Block and the North Hebei region of Northeast China. Intrusive-type mineralization (Saima nepheline syenite complex) also occurs at the Liaodong Block. Other locations with metasomatic uranium mineralization include the eastern Longshoushan and North Qilian fold belts in central China.

Uranium Resources

China's reasonably assured resources, plus estimated additional resources, exceed 140 million pounds equivalent U_3O_8, which is distributed among five primary districts/deposits (**Table 2**). Individual deposits of all types are generally of low grade (about 0.05 to 0.25 w/o U) and small tonnage. However, some districts contain several million pounds of reserves, with one district reaching 67 million pounds equivalent U_3O_8. More than 10 million pounds of the Chengxiang deposit's nearly 16 million pounds equivalent U_3O_8 have been mined. In Northeast China, the Langshoushan deposits were mined for several years; the Chinese government reported that the deposits contained over 250 million pounds of reserves.

NUEXCO estimates China is currently operating at 50 percent of its uranium production capability, which is believed to be in the range of 10 million pounds U_3O_8 per year. This production is thought to be reasonably competitive, with an associated cost of less than $20 per pound U_3O_8.

Uranium resource distribution by type of deposit shows that the bulk of resources in China are contained within four types of deposits:

Deposit Type	Share of total U resources
Granite-related deposits	41%
Volcanic-related deposits	20%
Sandstone type deposits	21%
Strata-structure type deposits	13%
Other [1]	5%

[1] Other: metasomatite, intrusive (alkaline syenite, pegmatitic granite), silicic breccia, lignite, phosphorite, and carbonate-hosted mineralization.

Table 2
China's Primary Uranium Districts

District	Resources (million lbs U_3O_8)	Deposit Type
Xiazhuang district, Guangdong province	31.2	granitic
Xiangshan district, Jiangxi province	67.6	volcanic
Qinglong district, Hebei province	20.8	sandstone-volcanic
Chanziping deposit, Guangxi province	13.0	strata-structure
Chengxiang deposit, Hunan province	15.6	strata-structure

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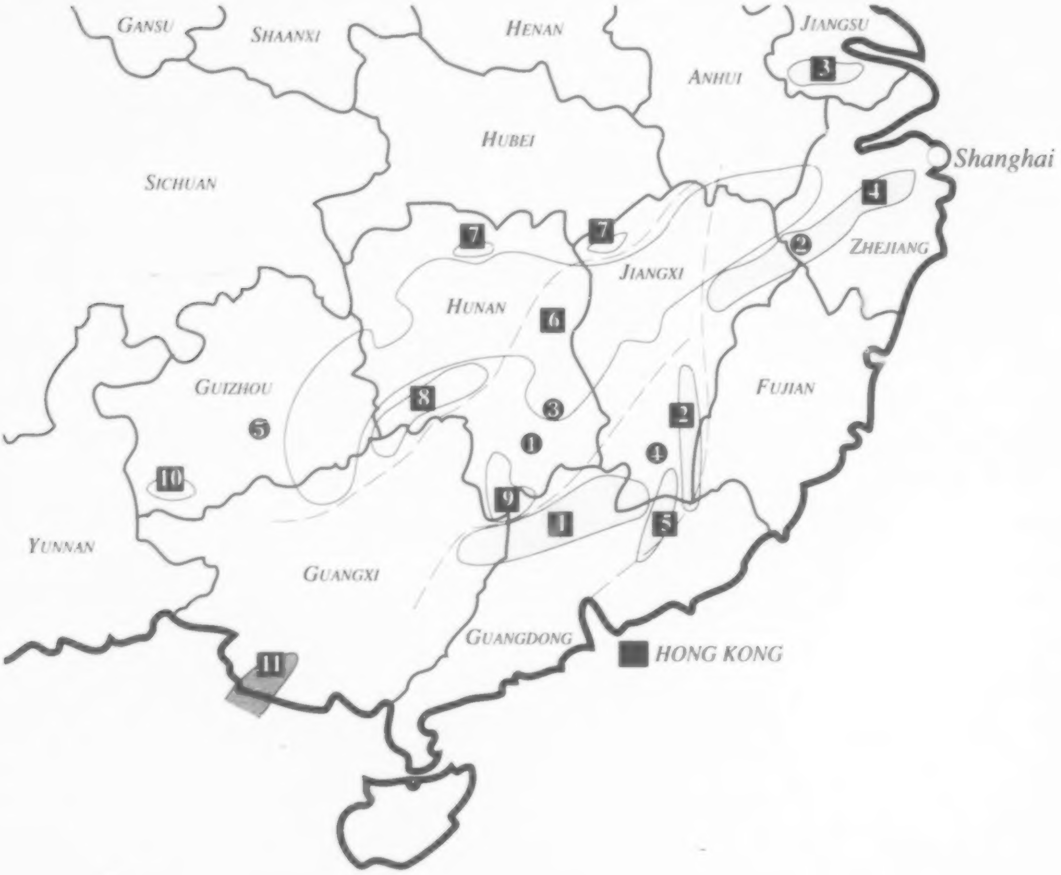
Figure 2
URANIUM MILLS AND DEPOSIT TYPES IN SOUTHEAST CHINA


GANSU
SHAANXI
HENAN
JIANGSU
3
ANHUI
HUBEI
Shanghai
SICHUAN
4
7
7
2
ZHEJIANG
JIANGXI
HUNAN
6
GUIZHOU
8
FUJIAN
3
2
5
1
4
10
9
1
5
YUNNAN
GUANGXI
GUANGDONG
HONG KONG
11

Legend

☐ Uranium belt or region—predominantly granite-related deposits

☐ Uranium belt or region—predominantly volcanite-related deposits

☐ Uranium belt or region—predominantly strata-structure type deposits

▨ Uranium belt or region—predominantly sandstone-related deposits

— — Boundaries of uranium-metallogenetic-tectonic domains

❶ Hengyang Mill

❷ Hengjian Mill

❸ Zhuzhou Mill

❹ Shao Kuan Mill

❺ Guizhou Mill

1 Nanling Uranium Belt

2 Central-Southern Jiangxi Uranium Belt

3 Lower Yangzi Uranium Belt

4 Gan-Hang Uranium Belt

5 S. Jiangxi–N. Guangdong Uranium Belt

6 Xuefong–Jiuling Uranium Region

7 North Side Jiangnan Block Uranium Region

8 South Side Jiangnan Block Uranium Region

9 Guangxi–Hunan–N. Guangdong U Region

10 Southwest Guizhou Uranium Region

11 Jingan Basin Uranium Region

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Ore Processing

China may have nine or more uranium beneficiation plants; their locations are given in **Table 3**. The last three plants listed in the table—Ürümqi in Xinjiang province, and unknown locations in Guangdong and Yunnan provinces—cannot be confirmed and may be only in the planning stages. The two primary mills, at Hengyang and Hengjian, are listed first, along with their estimated annual capacities.

Table 3
China's Uranium Processing Plants

- Hengyang, Hunan province – 3.1 million pounds U_3O_8 per year
- Hengjian, Jiangxi province – 1.7 million pounds U_3O_8 per year
- Zhuzhou, Hunan province
- Shao Kuan, Jiangxi province
- Huxian, Shaanxi province
- Lianshanguan, Liaoning province
- Ürümqi, Xinjiang province
- Guangdong province
- Yunnan province

Hengyang Metallurgical Plant, Hunan province

The mill at Hengyang (**Figure 3**) serves as the central metallurgical plant for uranium deposits in Hunan and adjacent provinces. The plant opened in 1962 and employs more than 4,000 people. It has a treatment capacity of up to one million metric tons of ore per year, which yields a production capacity of approximately 2.6 million to 3.1 million pounds equivalent U_3O_8 per year.

Ore delivered to the mill is stockpiled separately according to the origin of the deposit. The ore is crushed first by jaw crushers to less than 150 millimeters, and subsequently, by cone crushers to less than 40 mm. Wet grinding in ball mills reduces the particle size to less than 0.8 mm. The ore pulp contains 55 percent solids. Ore containing a high clay fraction is crushed and ground separately. Next, the ore pulp is separated in cyclones into solid and liquid components. The fractions are then treated separately.

Figure 3 — Hengyang uranium mill in central Hunan province.

Leaching takes place in Pachuca tanks by adding sulfuric acid at temperatures of about 75°C, and if necessary, oxidants. Sandstone-type ore is leached at lower temperatures than other types of ore, such as volcanic or granitic. Leaching time for the sandstone ore is low at 5 to 6 hours. Ore containing high percentages of organic carbon requires elevated acid amounts, up to 70 kg per metric ton ore. The solid particle fraction is treated in three stages and then deposited in tailings ponds.

After neutralization, the uraniferous solution is passed through ion exchange columns, where uranium is extracted from the ion-exchange resins with nitric acid. Uranium content in the strip-solution is

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approximately 10 grams per liter. The addition of ammonium hydroxide results in the precipitation of ammonium diuranate. After drying, this precipitate is calcined to U_3O_8 and then stored in barrels.

A pilot plant, with a capacity of about 25 metric tons ore per day, serves for ore testing by acid, alkaline, and high pressure-high temperature leaching.

Hengjian Mill, Jiangxi province

The Hengjian mill serves the Gan-Hang uranium district with an annual capacity of approximately 1.7 million pounds equivalent U_3O_8. Acid leaching of ore (usually volcanic type) produces a concentrate of about 43-percent uranium, with a recovery rate of 93 to 95 percent. The concentrates are hauled to the central metallurgical plant in Hengyang for refining. About 500 people work in the Hengjian mill, in three shifts per day, six days a week.

Conclusion

To meet the anticipated needs for its very ambitious nuclear program, China continues to explore for and develop uranium deposits throughout the country. While mostly lower-grade deposits have been located thus far, the geology of the country suggests that China has uranium resources far exceeding its domestic requirements, and will therefore remain active in the world export market.

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NUEXCO

SPEECH

SOVIET UNION'S URANIUM TRADE POLICY

The following article is an edited version of a speech presented on May 14, 1991 by NUEXCO Senior Vice-President James E. Vaughan at the World Nuclear Fuel Market Conference held in Atlanta, Georgia.

The World Nuclear Fuel Market (WNFM) first approached me to arrange for a speaker from Techsnabexport, but because of the short notice and schedule conflicts, that was not possible. So the WNFM asked me to speak instead. When I protested that I really could not add much to what had already been published, they said "come anyway, for your symbolic value."

On the theme of symbols, the symbol of the Soviet Union in the uranium market today must be the so-called Soviet uranium stockpile. In fact, it often seems that virtually no discussion about uranium can proceed without some mention of this allegedly huge stockpile. "Will the Soviets flood the market with this material?" is a typical question. Furthermore, according to what one hears, the stockpile seems to grow bigger every day. One almost expects the next question to be, "Do you suppose the gravitational force of this huge mass of uranium can affect the tides?" I sarcastically ask, "What if the stockpile is even bigger than that?" Perhaps, due to the effects of gravity, the stockpile might collapse under its own weight to form a neutron star. The stockpile already appears to obey the laws of quantum physics, as would a neutron star. For example, it appears to obey the *Heisenberg Uncertainty Principle* that holds that there is a limit to accuracy by which one can measure anything.

> ***These points just underscore the highly uncertain nature of any estimates of the size of the Soviet stockpile.***

With regard to the size of the Soviet stockpile, the uncertainty is enormous. Data directly from the Soviet Union is both limited and contradictory. The Uranium Institute recently estimated the size of the stockpile at 500 million pounds equivalent U_3O_8. This estimate was based on the difference between two figures: the first was cumulative uranium production in the USSR and Eastern Europe from 1945 until today; the second figure was cumulative civilian and military use of uranium in those same regions for the same period. Some of the data used in that estimate was extremely accurate: for example, production in Czechoslovakia and the former East Germany. On the other hand, any estimate of cumulative production in the USSR is highly speculative.

Even more speculative is the estimate of military uranium utilization. For example, the Uranium Institute's estimates of military use were based on an assumed number of warheads, and an assumed amount of uranium required to produce them—the latter based on Western experience. But new and often surprising revelations continue to emerge regarding the Soviet economy and military. Only a year or so ago we were all surprised when the Soviets announced they had been using centrifuge enrichment since 1952, not gaseous diffusion as we had all assumed. Also, based upon revelations of Soviet economists, it seems that the CIA consistently and substantially overestimated the size of the Soviet economy. Thus, any estimate of Soviet military data must be viewed as very uncertain. This is not to belittle the efforts of the Uranium Institute. I was part of the working committee that produced the estimate. These points just underscore the highly uncertain nature of any estimate of the size of the Soviet stockpile.

Getting back to quantum physics, the Soviet stockpile also could be said to obey the *Pauli Exclusion Principle*. This Principle states that no two particles can occupy the same energy level. By analogy, I would postulate the Vaughan Exclusion Principle: no unit of uranium in the Soviet Union can be part of both the civilian and military inventory. The military in the Soviet Union remains very influential, as recent events bear out. I propose that uranium already transferred to the military would not be available to the civilian sector to sell to the Western market. It is excluded.

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> ***The major drag on the market remains what it has been for some time—not a stockpile in the East, but the stockpile in the West.***

Having established a Soviet civilian stockpile of very uncertain size, we can then ask what the likelihood is that some of this stockpile will make its way to the West. In other words, what is the probability of the *Tunnel Effect*?

I can confirm that this tunnel effect probability is greater than zero, since it has already happened. NUEXCO has moved about 100 metric tons of Soviet enriched uranium to the USA. The main purpose of this stockpile in the West is to offer security of supply to potential customers. It is our plan to increase this stockpile substantially to guarantee smooth deliveries under long-term contracts. Thus, Soviet inventory will continue to reach the West to help continue ongoing operations, or in other words, to demonstrate *Conservation of Momentum*.

The Soviet Ministry of Atomic Energy and Industry operates uranium mines (the majority of which are co-product mines), as well as enrichment plants. Information on uranium conversion and enrichment in the Soviet Union was published in the April 1991 NUEXCO Monthly Report (#272, p. 27-35). The Ministry plans to keep these operations producing in order to keep the work force employed. They hope to accomplish this, in part, through exports. Such an objective is incompatible with the liquidation of a huge stockpile.

Having said all this about the Soviet stockpile, let me turn for a minute to discuss the extent to which Soviet uranium sales have penetrated the market. Recently, NUEXCO estimated the sources of the approximately 35 million pounds equivalent U_3O_8 that will be used in the European Community this year. Of the many sources, the major source is the drawdown and redistribution of European Community inventories. On the second plateau are imports from Niger and production in France. On the next level, are imports from Canada and the Soviet Union. The next most important sources are recycled uranium and plutonium, and imports from Gabon and Australia. So as you can see, the major drag on the market remains what it has been for some time—not a stockpile in the East, but the stockpile in the West.

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SPEECH

THE MARKETS FOR URANIUM AND ENRICHMENT

An Overview of Current Status & Future Directions

The following is an edited version of the speech presented by George White Jr., Senior Vice President of NUEXCO, at the General Electric Company's Executive Fuel Conference, on May 20, 1991 at Hilton Head Island, South Carolina.

Introduction

My assigned mission today is to provide some perspective on the current status and the likely future direction of the markets for uranium and enrichment services. Uranium and enrichment are to nuclear reactors what crude oil and refining are to automobiles. And, concerns about uranium and enrichment will, or should, be similar to the motorist's concerns about gasoline. Is there enough of it? How much does it cost?

URANIUM

Let us look at uranium first. The big picture is easily described.

- Is there enough uranium to go around? The answer is an unequivocal and resounding "Yes."
- Will it always be possible to buy uranium at the current spot price level of some $9.00 per pound U_3O_8? The answer is an equally unequivocal "No."
- Given then, that the price of uranium must eventually rise, will it, nevertheless, always be possible to buy uranium at prices that will continue to assure nuclear's competitive advantage? Another resounding "Yes."

Let me provide a bit more detail. Already identified, reasonably assured resources are sufficient to support any realistically imaginable level of nuclear power development well into the 21st century. Furthermore, and the record is very clear on this point, as we have continued to explore for uranium, we have continued to find more of it. Of particular consequence, the more recent discoveries have been larger and richer, by an order of magnitude, than those that launched the nuclear era some 40 years ago. Suffice it to say that the resources are vast.

Unfortunately, the best uranium resources are not found in those countries that have the largest nuclear power programs. Thus, the largest and/or richest uranium provinces are found in Australia, western Canada, central Africa, and Namibia rather than in the United States, western Europe or Japan. While extensive, US resources are relatively lower grade, higher cost, and the uranium produced from them is, consequently, relatively more expensive.

In my view, therefore, it is extremely difficult to make a compelling case for any limitations on the import of foreign-origin nuclear fuel. I submit that a more persuasive argument can be made for exploiting the lower-cost, lower-priced uranium available from resource rich countries, and saving US uranium for the proverbial rainy day. US dependence on imported uranium has been likened by some, however inappropriately, to US dependency on imported oil. It would be my view that expressions of concern that the security of US uranium supply is jeopardized by the level of imports simply fail the test of reason. Uranium inventories in government and private hands are equivalent to several years' forward usage; further, import sources are geographically diverse, making it most unlikely that all could fail simultaneously; finally, as noted above, the US has its own, albeit more costly, sources of supply. In view of the above, I would suggest the security of supply issue is really moot.

Given that there is plenty of it, the only other major concern about uranium is its price. At $9.00 per pound U_3O_8, the current uranium spot price is at an all-time low. **Figure 1** depicts the history of the NUEXCO Exchange Value. I should note that the Exchange Value has for years been viewed as a surrogate or proxy for the spot price of uranium. As can be seen, prices have cycled in rather

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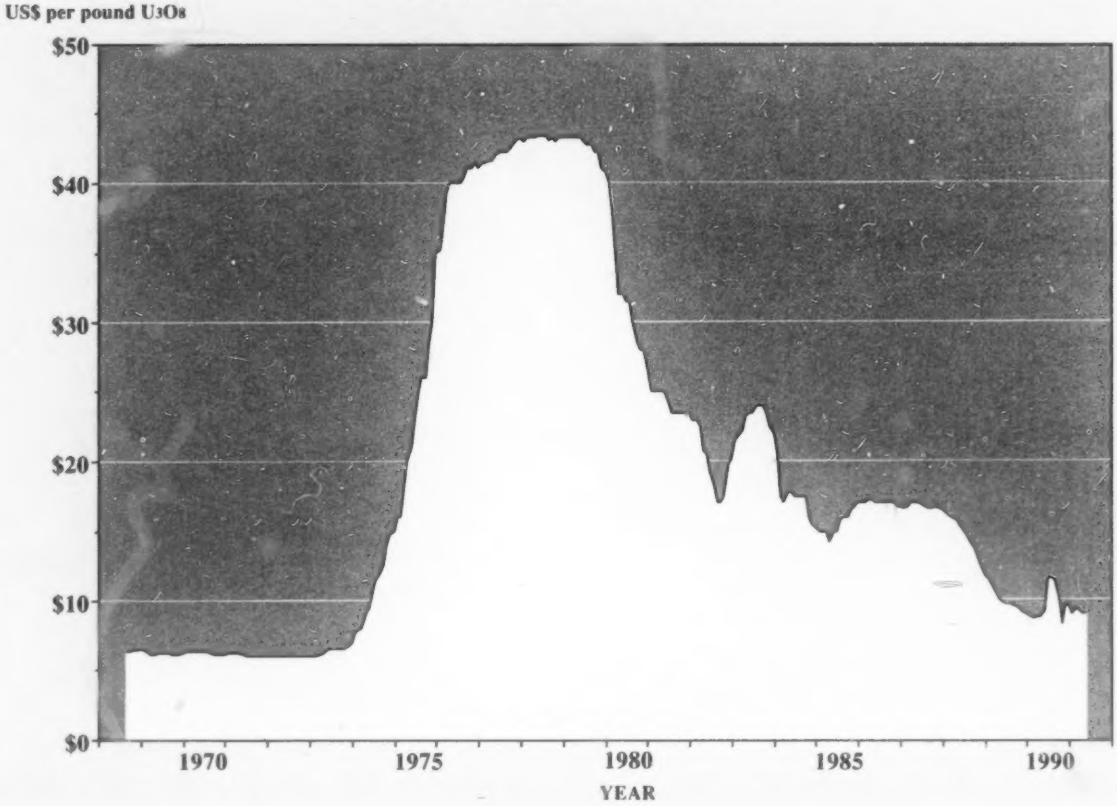
Figure 1
HISTORICAL NUEXCO EXCHANGE VALUES



dramatic fashion—from $6.00, to $43.00, and now back to $9.00. Even more instructive, perhaps, is **Figure 2** that reflects these same prices adjusted for inflation.

Since a 1,100 MWe boiling water reactor consumes about 500,000 pounds of U_3O_8 per year, we are looking at annual uranium expenditures, based on current price levels, of only some $4.5 million per reactor per year. Back in 1977, that same 500,000 pounds would have cost more than $21 million. Adjusted for inflation, that 1977 cost would have been greater than $39 million. While such costs may pale in comparison to overall utility expenses, or even to overall nuclear operation and maintenance expenses, the difference between $4.5 million and $21 million is substantial.

And, why are uranium prices at such low levels? The simple answer is that supply exceeds demand. However, this doesn't really adequately explain the situation, for with actual consumption substantially higher than production, one would expect strong and rising prices. Indeed, 1990 Western World production of 75 million pounds U_3O_8 fell some 45 million pounds short of matching 1990s consumption of 120 million pounds. The 1991 shortfall is forecast to be even larger, at 58 million pounds, as consumption increases to 125 million and production declines further to 67 million pounds. The missing link is, of course, inventory. At the beginning of 1991, excess Western World uranium inventories were estimated at 160 million pounds U_3O_8. In this context, "excess inventory" is defined as inventory that is in excess of identified "normal" or "desired" levels and is, therefore, available for sale or loan.

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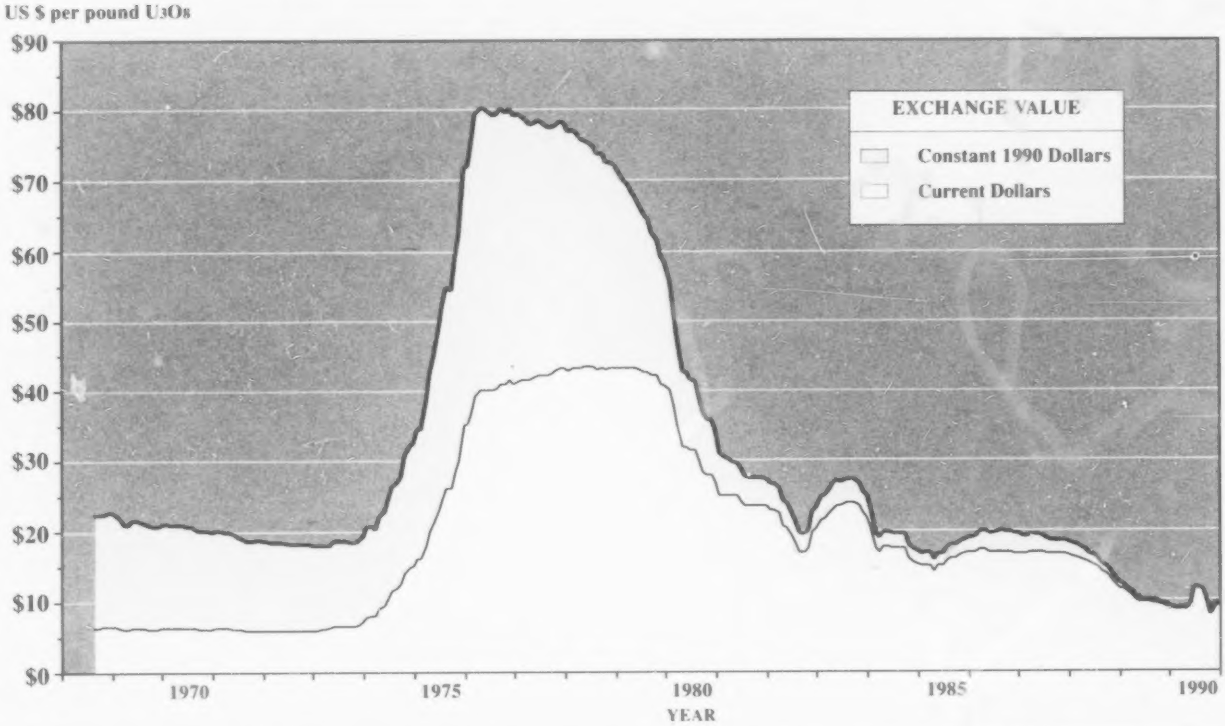
Figure 2

HISTORICAL, INFLATION-ADJUSTED NUEXCO EXCHANGE VALUES



In addition, as a consequence of political changes during the past two years, and the development of a world market in nuclear fuel, large new uranium sources have become available from China, eastern Europe, and the Soviet Union. These sources share some or all of the following characteristics:

- A uranium supply capability well in excess of civilian needs.
- The reduction or elimination of military requirements for uranium.
- The existence of substantial excess uranium inventories.
- A pressing need for foreign exchange.

The Soviets and the Chinese, in particular, have indicated that they intend to become world-class uranium suppliers. The availability for sale from these sources of both production and, more particularly, large inventories will almost certainly delay, by several years, any meaningful or lasting price recovery.

Though large inventories over-hang the uranium market, economics have, at last, begun the process of forcing the uranium supply/demand equation into balance. In time, as these excess inventories are absorbed, production must increase to the level of consumption. And such increased production means new mines and mills. But, the financing of such new facilities requires uranium prices that can guarantee a return on investment. While I cannot forecast with any confidence or accuracy the exact price level required to motivate production of the 173 million pounds of uranium needed to meet worldwide utility requirements in the year 2000, I can absolutely assure you that it is more than $9.00 per pound U_3O_8; and, with almost equal assurance, I can state that it is unlikely ever again to approach $30.00 per pound. Regardless of the specific level, uranium prices will never be the deciding factor in the economics of nuclear power.

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ENRICHMENT SERVICES (SWU)

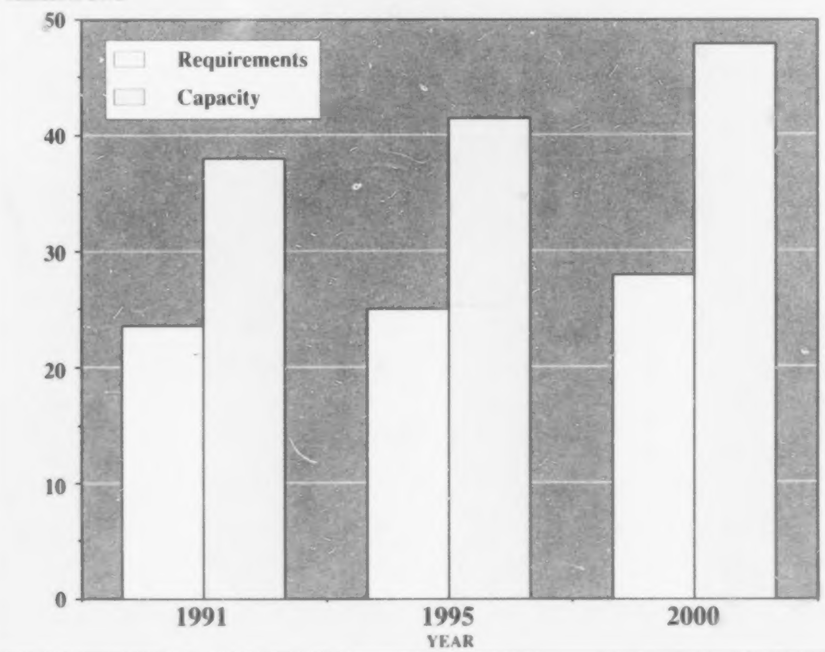
Turning now to enrichment, we are dealing with a market that is both different and manifestly more complex than uranium. **Figure 3** provides a snapshot of the current enrichment market, comparing worldwide SWU production capacity and SWU requirements through the year 2000. The extent of overcapacity is evident. **Figure 4** provides a breakdown of the individual suppliers. They include:

- **DOE**, which operates two gaseous diffusion plants (at Paducah, Kentucky and Portsmouth, Ohio) with total annual capacity of over 19 million SWU, representing about 50 percent of world capacity. Note that this figure does not even include DOE's eight million SWU-per-year Oak Ridge, Tennessee plant, which was placed on standby in 1985.
- **Eurodif**, whose marketing is controlled by Cogema, France's national fuel cycle organization, can produce 10.8 million SWU annually at its gaseous diffusion plant located at Pierrelatte, France.
- **URENCO**, a tri-national European consortium, operates centrifuge plants in the UK, the Netherlands, and Germany, with a total annual capacity of some three million SWU.
- **The Soviet Union**, utilizing centrifuges to produce essentially all of its SWU, currently has the capability to export 3 million SWU annually, and has announced that figure could grow to 10 million SWU annually by the mid-1990s. Such data indicate that overall Soviet production capability is well in excess of 10 million SWU annually.
- **China**, using gaseous diffusion technology, has a small, but as yet unutilized, export capability.
- **Japan**, with a pilot centrifuge plant, produces much smaller and, to date, non-commercial quantities of SWU.

In addition, there are two other potential SWU suppliers on the horizon:

- **Louisiana Energy Services**, known as LES, is a joint venture involving Duke Power Company, Northern States Power, and Louisiana Power & Light, with URENCO providing the centrifuges and Fluor-Daniel providing engineering and construction services. By 1996, LES hopes to have an $850 million centrifuge plant, capable of producing 1.5 million SWU annually, in operation in Louisiana. To that end, it is currently engaged in an aggressive marketing campaign to base load the facility.
- **CRISLA Technologies**, promising chemical-laser technology developed in the US private sector, has moved to Canada for funding. CRISLA is also busy marketing and, if the technology proves out, hopes to have a small plant in operation by the mid-1990s.

Figure 3
PROJECTED ANNUAL WORLD ENRICHMENT REQUIREMENTS AND CAPACITY FOR WESTERN WORLD
(Requirements at 0.30 w/o Tails Assay)



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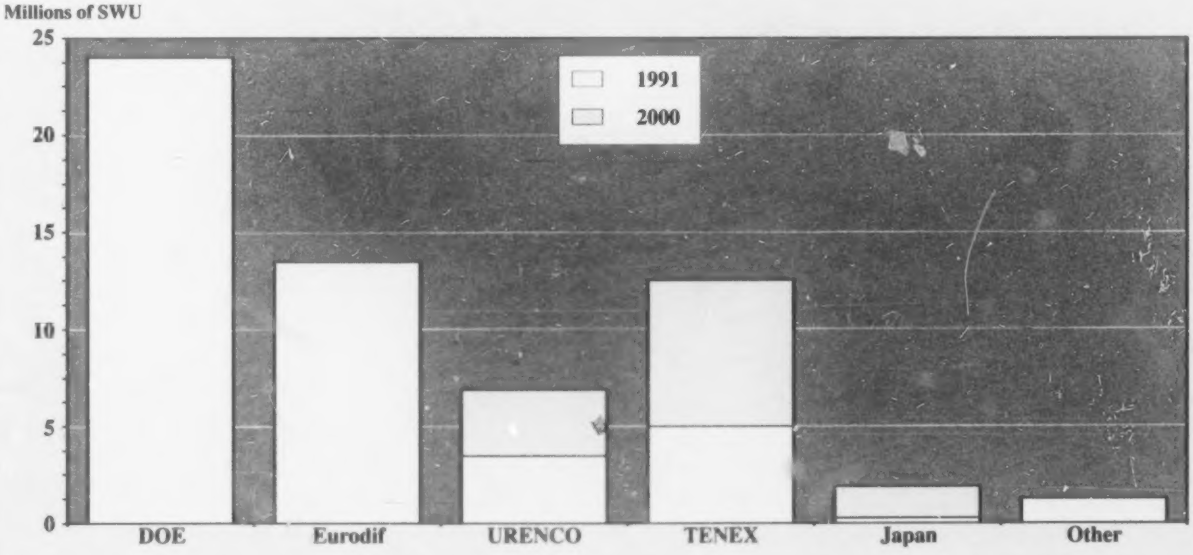
Though steadily losing market share during recent years, DOE remains the largest single factor in the enrichment industry, and the key to understanding the market. In 1970, DOE's control of the world enrichment market was essentially complete—effectively a total monopoly. However, as nuclear programs grew, DOE's ability to supply SWU was increasingly stretched. For European utilities particularly, a combination of security of supply and nationalistic concerns provided irresistible arguments for locating new enrichment capacity in Europe. DOE's closing of its order books in late 1972 led to the first terminations, as the European SWU buyers underwrote and committed to purchase from Eurodif and URENCO. DOE lost additional market share in the early-1980s as excess SWU inventories led to market imbalances and the development of an active and aggressively priced spot market.

Given this existing and potential new capacity, one wonders if there any reason to worry about enrichment. The answer, unfortunately, is "Yes." Unlike the uranium market, the SWU market has, to date, shown little evidence of commercial rationality. Political considerations, including well-intentioned non-proliferation concerns, control. These, in turn, have led to some unusual situations.

- More than two-thirds of world enrichment capacity is now represented by plants which utilize the power-intensive and expensive 40-year old gaseous diffusion technology, and the majority of that capacity is US-based and not built to current regulatory standards.
- A 3.6 billion dollar US investment in centrifuge technology was totally written off and the hardware destroyed in favor of a yet-to-be-demonstrated, laser technology known as AVLIS (Atomic Vapor Laser Isotope Separation), which DOE now appears to be allowing to wither on the vine.
- As noted earlier, a consortium involving three US utilities has moved to exploit centrifuge technology in the US.
- It has recently become known that the Soviet Union, using centrifuge technology, development of which began in the 1950s, may well be the world's lowest-cost SWU producer.

Accordingly, and to the extent that utility managers have time to devote to the front end of the fuel cycle, I would strongly suggest that they focus on enrichment, for it is this area that has the greatest potential for unexpected and costly events. Mere understanding of the

Figure 4
ESTIMATED URANIUM ENRICHMENT CAPACITY AVAILABLE BY SUPPLIER FOR WESTERN WORLD



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situation may not forestall such events from occurring, but such understanding, combined with advance planning and a pro-active posture, can reduce or eliminate the possibility of expensive and embarrassing surprises.

From literally "owning" the entire SWU market in 1970, DOE's share has eroded to the point that, based on recent customer notices, of an estimated US demand of some 10 million SWU in the year 2000, only ten percent is currently committed to DOE. What happened? As noted above, security of supply and nationalism were certainly the prime movers in launching Eurodif and URENCO, but thereafter, it has been simply a matter of price and DOE's inability to respond rapidly and effectively in a changing marketplace.

It is not overstating the case to note that DOE's enrichment business is in crisis. In my view, that crisis will, in turn, impact nuclear utilities in general and US nuclear utilities in particular. DOE's overriding problem has been, and remains money or, more accurately, the lack thereof. Simply put, despite a legal mandate to recover all of its costs, DOE has not done so. Concerned that raising its prices would lead to customer defections, DOE, despite being the highest-cost SWU producer, attempted to compete on price. DOE lost on both counts: its cash flow was penalized *and* its customers terminated. Thus, DOE is now selling fewer SWU at lower prices.

At the same time, DOE faces billions, perhaps tens of billions, of dollars of unfunded decommissioning and decontamination costs. Additional, unplanned costs will be incurred to mitigate recently identified PCB problems and for the ultimate disposal of some 45 years worth of uranium tails generated by the diffusion plants. Still further funds will also be needed for AVLIS. And, as the Clean Air Act increases the price of electricity, DOE's SWU production costs will also rise, even as the availability of cheap, off-peak power declines.

Where will the money come from? As seen, higher SWU prices are not an answer, for higher prices, coupled with DOE's chronic inflexibility, will only lead to further customer defections and further reduction of the revenue stream. And, I doubt, in the current political environment, that taxpayers will be asked to foot the bill directly. Consequently, I'm forced to the conclusion that somehow, someway, US nuclear utilities are the obvious candidates to end up holding the bag. A usage fee, a service charge, or some similar special levy—perhaps 1, 2, or 3 mills per kilowatt hour—will appear one day, likely with little or no advance notice.

DOE proposes to solve all its money problems by turning itself into a government corporation, arguing that in a corporate form the enrichment business would be removed from the cumbersome Congressional appropriation process and would be able to do all those things that normal businesses do, including, most importantly, borrowing money. Legislation establishing such a corporation has passed the Senate several times in prior years, but each year it has died in the House, and chances for enacting the legislation this year don't seem much better.

The legislation has lacked support because it does not appear to provide any tangible benefits to enrichment customers. It has also been characterized as a transparent attempt by DOE to get out from under its most onerous financial burdens, and gain its own direct access to capital markets. And, so the debate rages. In fact, DOE's recent actions, or perhaps I should say inactions, including delays in the deployment of its new AVLIS technology, could lead one to conclude, without undue cynicism, that DOE has created its own crisis, purposefully making a shambles of its business to impress upon the Congress the severity of the situation and the need for passage of the enrichment legislation.

Such an approach is fraught with danger for both DOE and its customers. By tossing the problem into Congress' lap, they risk losing all control over the outcome. Political rather than market considerations may dominate. There are those in the Congress who believe that DOE should be out of the enrichment business entirely by the turn of the century. Even that would be acceptable, if reliable, alternate supply is available on a timely basis. But no such supply is currently in sight. The US enrichment enterprise is aging, high cost, not licensable under current regulations, deeply in debt, and, to date, without a successor technology.

Let me also make brief mention of another aspect of this situation—what I choose to call the "image problem." The environmental issues and costs associated with the eventual cleanup of the three gaseous diffusion plants, as well as such defense-related facilities as Hanford, Savannah River, and Fernald, are going to loom large and prove very troublesome as the media and the public come to understand the magnitude of the problem. This situation is sure to generate a great deal of negative press and stir up a considerable emotion; fairly or not, the local nuclear utility will end up as the villain.

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In summary, the enrichment market is troubled, because DOE, its biggest player, has big problems. However, using a medical analogy, it is often easier to recognize that someone is sick, than to prescribe an appropriate cure. But, to continue that analogy, accurate diagnosis is a necessary precursor to successful treatment; hence my admonition that utility management get smarter about enrichment.

A COMMERCIAL COMMENT

Having been a salesman for more than 25 years and having been with NUEXCO for nearly 20, I cannot let this opportunity pass without offering at least some commercial observations. Early on in the nuclear game—in the late-1960s and early-1970s—vendors were selling the utilities not only nuclear reactors and turbine generator sets but also fabricated fuel. In time, two trends emerged. First, the utilities, believing it was prudent for them to have more control of their fuel procurement schedules and practices, elected to unbundle nuclear fuel into its component parts—uranium, conversion, enrichment, and fabrication. They also wanted to save money by buying uranium, conversion, and enrichment directly from primary suppliers rather than purchasing it through fuel vendors in the form of fabricated fuel. Concurrently, the fuel vendors recognized that their technical expertise in fabrication was not matched by similar expertise in purchasing and reselling uranium, conversion, and enrichment.

So the utilities took over this purchasing—uranium from uranium producers, conversion from convertors, and enrichment from DOE (and its predecessors AEC and ERDA). The catch phrase was "security of supply via long-term contracts with responsible suppliers." Needless to say, such contracts commanded premium prices. In the uranium market, the rationale for such a premium was based on the fact that published spot prices, primarily the NUEXCO Exchange Value, related only to a minor portion of the uranium market—perhaps only five percent—and were not indicative of the "real" price of uranium.

To the dismay of most uranium producers, this point of view did not prevail. The spot uranium market continued to grow in both size and importance, exerting ever-increasing influence on long-term pricing. The past ten years has also witnessed the development of spot and secondary markets for conversion and enrichment services. In fact, it would be my view that all three—uranium, conversion, and enrichment—have become commodities. In addition to NUEXCO, five other organizations now publish uranium prices on a regular basis; two publish conversion prices, and three publish enrichment prices. Fabrication has not, however, gone through the same process. Technology is not easily commodified.

With the development of well-defined markets and recognized pricing systems for uranium, conversion, and enrichment, it is not surprising that we have seen the beginning of a movement toward bundling them together once again, creating a new commodity—enriched uranium product or EUP. A senior fuel manager expressed to me as follows:

> George, if I could get someone to take over all my individual uranium, conversion, and enrichment contracts, and, instead, deliver market-priced EUP to me at my fabricator, I could save a ton of money. I could reassign a number of my people now involved in nuclear fuel analysis and procurement to other activities. In addition, I could avoid the carrying charges associated with acquiring nuclear materials and services prior to the date of actual need.

He is, of course, right, but who is that brave someone? The logical parties are the fuel fabricators, but, as noted earlier, they have come to recognize that their forte is technology, not commodity trading. That really leaves only the trading companies. Indeed, I suggest a persuasive case can be made that a trading company, through its worldwide affiliations, can provide greater security of supply than can any *individual* uranium producer, convertor, or enricher. If the truth be known, nuclear utilities don't care a whit about uranium, conversion, or enrichment per se; they do care about having EUP at their fabricators on time. In fact, security of supply becomes meaningless when any single party in the nuclear fuel cycle chain fails to perform. Contrast this with a trading company which has continuing access to multiple supply sources at each step in the fuel cycle. Thank You.

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NUCLEAR INDUSTRY CALENDAR

1991	
June 23-26	***International Conference on Enrichment*** (The Westin Hotel, Washington, DC). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES, 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.
1992	
April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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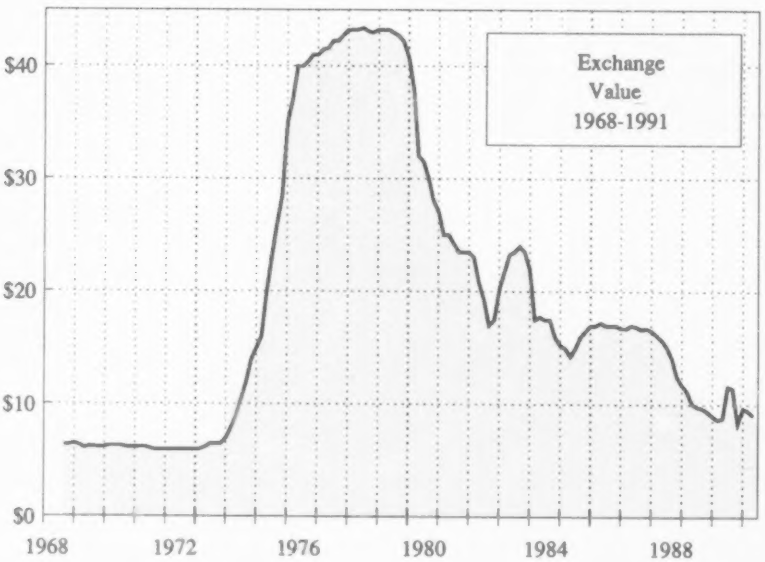
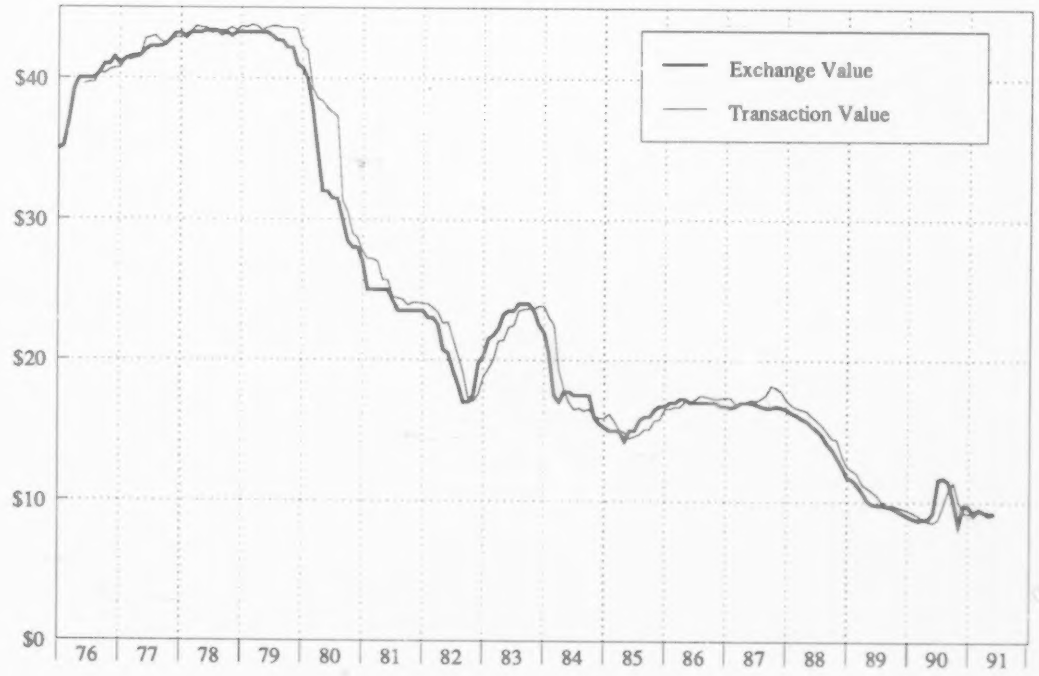
NUEXCO Historical Exchange Value and Transaction Value

(in US dollars per Pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	[illegible]	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	**9.20**							

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF6 Values

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	**27.60**							

US Premium (Relative to the UF6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	**1.50**							

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	**9.30**							

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	**54**							

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Loan Rates

Year	Determined as of the last day of the month indicated (Percent per Annum)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	**3.50**							

* Float with Prime Rate

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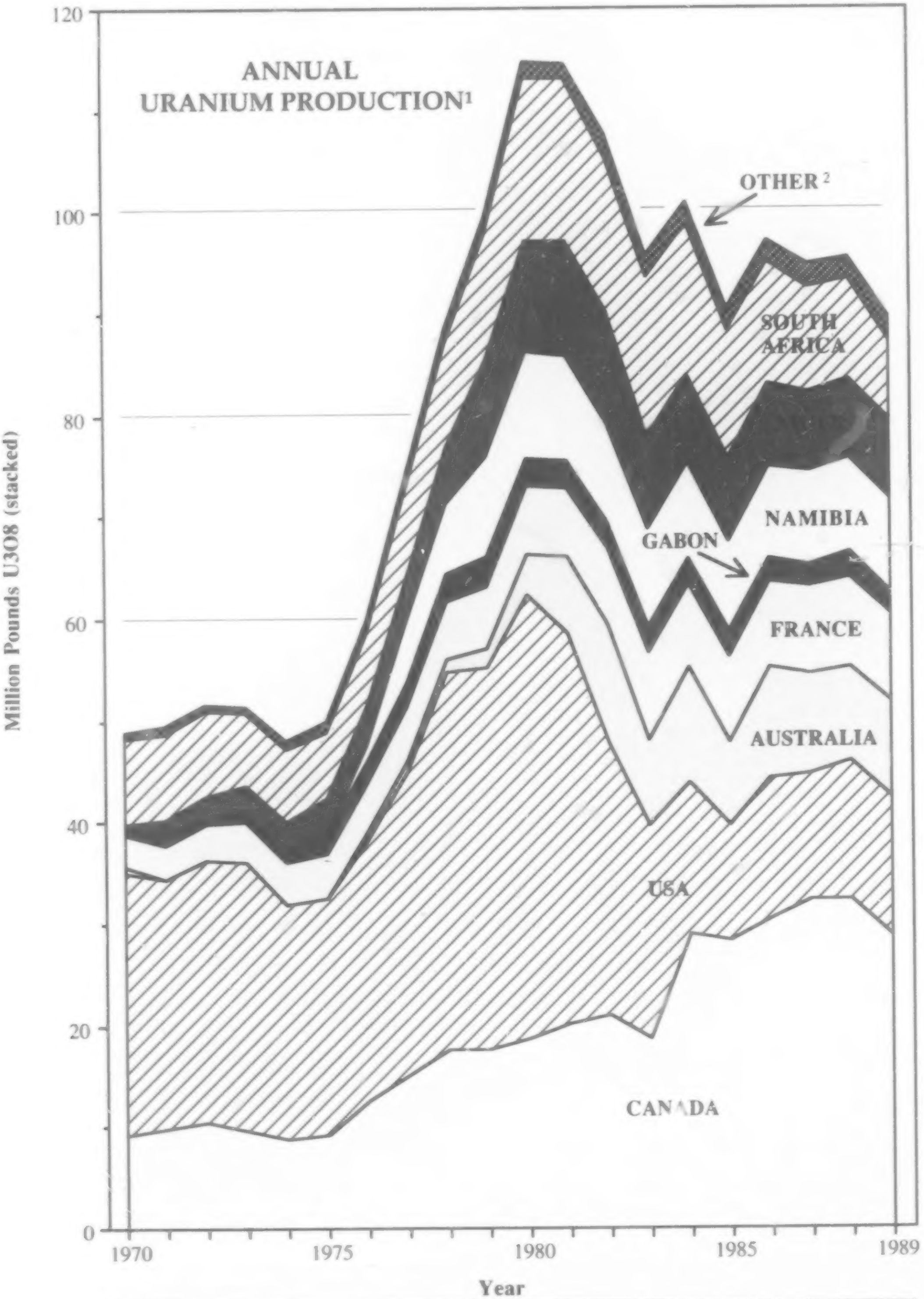

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3)

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, (West) Germany, and Yugoslavia

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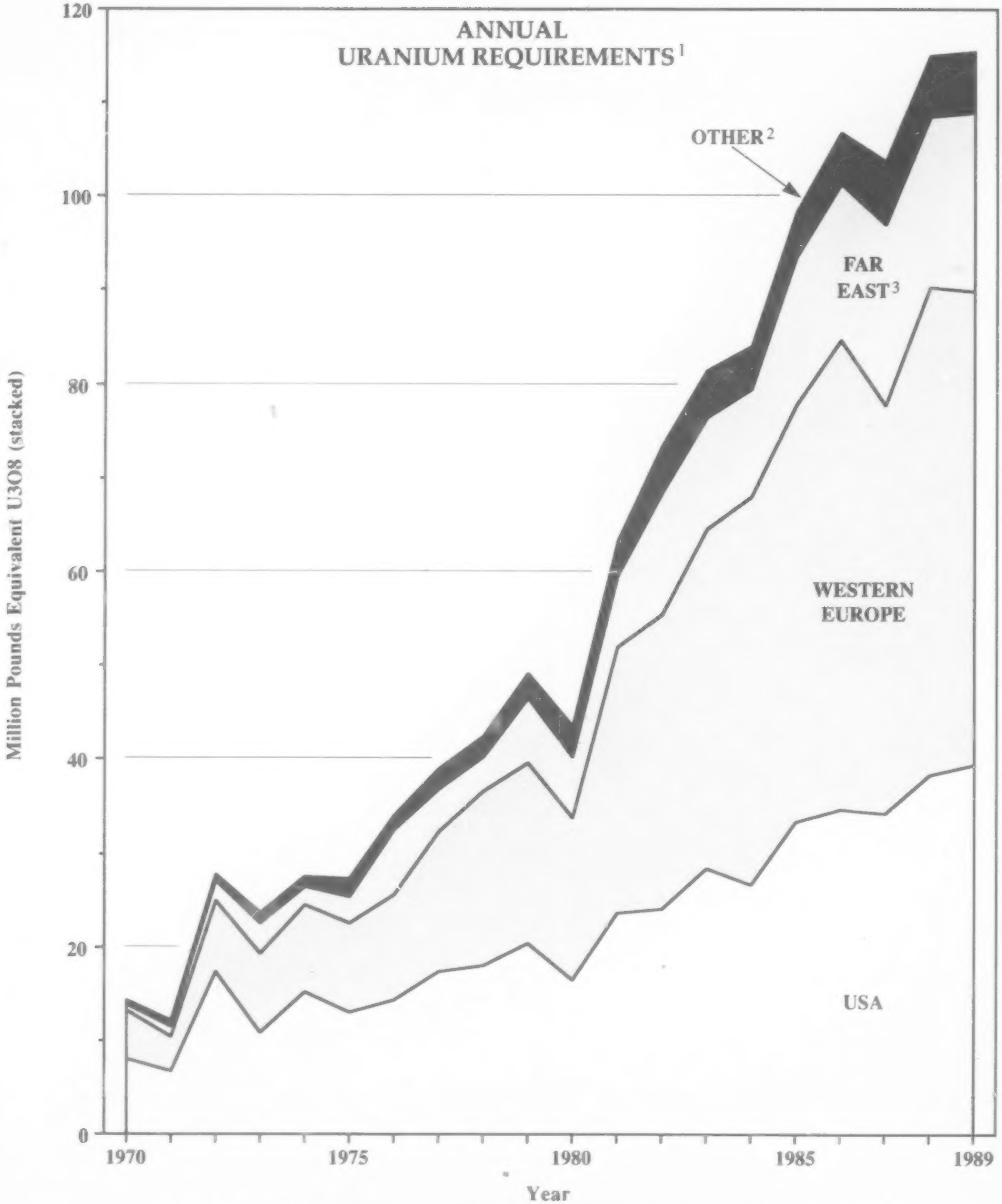
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6**R**
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7**R**
Apr	1990	—	119.9	—	129.0**R**
May	1990	—	118.9	566.60	129.2**R**
June	1990	207.4	116.6	—	129.7**R**
July	1990	—	116.4	—	129.9**R**
Aug	1990	—	122.4	574.10	130.1**R**
Sept	1990	208.9	128.2	—	130.4**R**
Oct	1990	—	134.1	—	130.5**R**
Nov	1990	—	133.7	589.20	130.4**R**
Dec	1990	214.5	128.8	—	130.5**R**
Jan	1991	—	125.6	—	130.5**R**
Feb	1991	—	121.5	—	130.4**R**
Mar	1991	214.1	—	—	130.5

P = Preliminary **R** = Revised since last month

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[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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Canada

		Industrial Products Price Index: All Commodities [1] (1986 = 100) [2]	Consumer Price Index: All Items (1986 = 100) [3]	Wage-earner Data: Average Hourly Earnings (C$) [4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	—·—	—·—	—·—	—·—	—·—
1981	Avg.	83.4	75.5	—·—	—·—	—·—	—·—	—·—
1982	Avg.	89.0	83.7	—·—	—·—	—·—	—·—	—·—
1983	Avg.	92.1	88.5	17.22	—·—	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	—·—	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.8	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	110.9	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.2**R**	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6**R**	125.0	25.23**R**	22.45**R**	20.13**R**	14.63**R**	16.10**R**
Mar	1991	110.0**R**	125.5	25.3[illegible]**P**	22.69**P**	20.43**P**	15.28**P**	16.41**P**
Apr	1991	109.7	125.5	—·—	—·—	—·—	—·—	—·—

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	660,151	942,831
Jan	1991	—	—	219.5	218.0	648,944	935,839
Feb	1991	—	—	222.2	219.3	—	—
Mar	1991	137.66	323.82	224.1	218.5	—	—
Apr	1991	—	—	227.3	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0**R**	118.7**R**	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	118.3	118.9	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80**R**	14.55**R**	13.81**R**	10.59**R**
Mar	1991	115.6	116.1	135.0	134.8**R**	14.91**P**	14.57**P**	13.84**R**	10.56**R**
Apr	1991	115.5	116.0	135.2	—	–·–	–·–	13.97**P**	10.60**P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1989: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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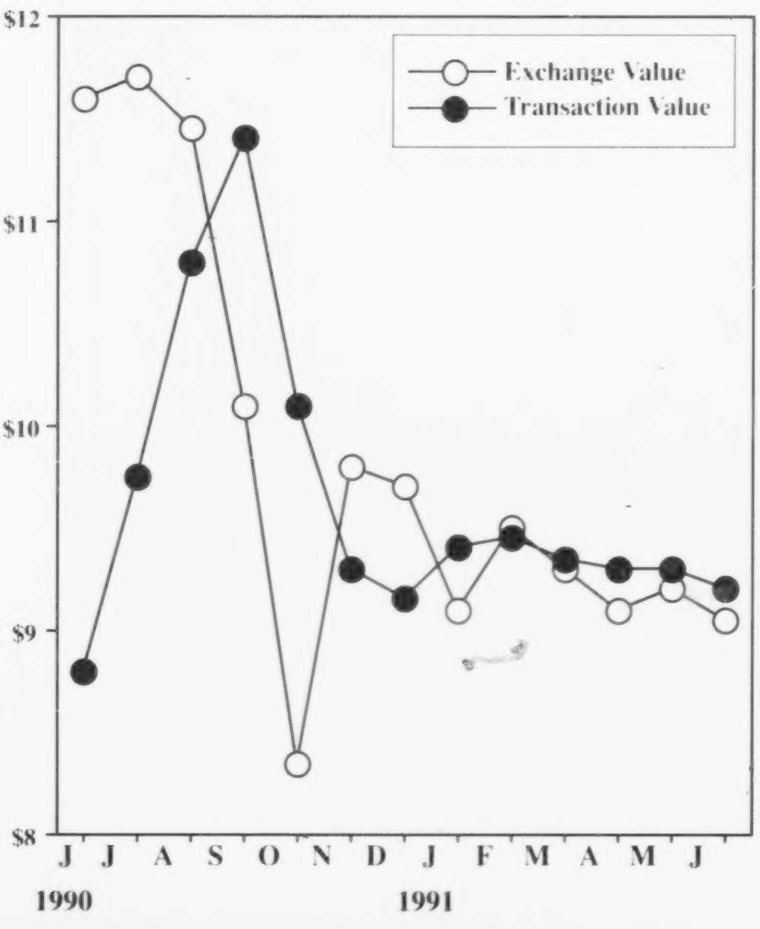

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After 45 years of secrecy, details of the Bulgarian uranium industry are finally being released. In April, Thomas C. Pool visited several of Bulgaria's production centers, and describes in this article the industry's breadth and structure — and its problems.

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- **The Present and Future of Nuclear Energy and Industry in the USSR**

Mr. Vitaly F. Konovalov, Minister of the Soviet Union's Ministry of Atomic Energy and Industry, recently spoke in Tokyo to the JAIF about the nature of the Soviet Union's commercial nuclear industry.

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The world backlog contains 59 commercial nuclear reactors in 15 countries. This article describes the construction status for each country, and lists all the commercial nuclear units actively under construction.

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To Our Readers

NUEXCO is proud to report the 20-year service anniversary of George White Jr., who started his career with NUEXCO on July 6, 1971. George joined his father, a co-founder of NUEXCO, after working for Drexel Firestone, Inc. in New York where he was active in the bond market. George has been instrumental in NUEXCO's growth and has helped to establish its reputation in the marketplace. He is currently a Senior Vice-President of the company and is based in our San Francisco, California office. We congratulate George on his achievements.

* * *

CONCORD/NUEXCO is also pleased to announce that Mr. Ken C. Whyte has joined the International Advisory Committee (IAC). Mr. Whyte is well-known in business and financial circles, and is a knowedgeable authority on southern Africa. He is the director of several South African companies operating in the fields of prospecting, mining, trading, and finance. He is a Chartered Accountant and formerly a partner of Coopers & Lybrand. Mr. Whyte is also very active environmentally, owning and operating a large private game farm to promote the population of threatened species. CONCORD/NUEXCO is proud to welcome him to the IAC.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report June 30, 1991	Last Report May 31, 1991	12 Months Ago June 30, 1990
EXCHANGE VALUE[1]	**\$9.05**/lb equivalent U_3O_8	\$9.20	\$11.60
UF_6 VALUE[2]	**\$27.25**/kg U as UF_6	\$27.60	\$32.00
LOAN RATE[3]	**3.5%**/annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.50**/lb U as UF_6	\$1.50	\$1.45
SWU VALUE[5] (0.3 w/o tails assay)	**\$59**/SWU	\$54	\$50
TRANSACTION VALUE[6]	**\$9.20**/lb equivalent U_3O_8	\$9.30	\$8.80
Transactions	**24**	21	38
Months	**3**	3	3
Millions of Pounds	**6.3**	5.3	11.3

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Value** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- b) At least ten transactions;
- c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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JUNE MARKET REVIEW

(as of June 30, 1991)

OVERVIEW

The uranium market softened during June, as reflected by the June 30, 1991 Exchange Value, which dipped $0.15, to $9.05 per pound U_3O_8. Following the concentrates market, the UF_6 Value also declined, dropping $0.35, to $27.25 per kgU as UF_6. Ten uranium sales were reported totalling 2.3 million pounds equivalent U_3O_8. Nine sales involved concentrates, and one involved natural UF_6. No enriched uranium product (EUP) sales were reported during June.

Each of the separate sections of this market review will present information about the year-to-date transactions. As of the end of the first half of the year, 57 near-term uranium sales have been reported for a total of 13.5 million pounds equivalent U_3O_8 (**Table 1**). These year-to-date figures reflect all near-term uranium transactions of which NUEXCO is aware, including some transactions that have not been reported previously due to confidentiality concerns or lack of information at the time of the transaction. The 1991 level of 57 sales for a total of 13.5 million pounds is the second highest in uranium spot market history, but lags significantly behind the record uranium sales and volume of the first half of 1990 that totalled 69 transactions and 22.7 million pounds equivalent U_3O_8. Market uncertainty, more cautious buyers and sellers, and lower demand, both actual and discretionary, have all contributed to this year's lower market volume.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	June 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	9	2.3	37	7.9
Natural UF_6	1	<0.1	13	4.3
EUP	0	0.0	7	1.3
Total[2]	**10**	**2.3**	**57**	**13.5**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

The June 30 Loan Rate and Conversion Value both were unchanged, at 3.5 percent per annum and $1.50 per pound U as UF_6, respectively. Two loans totalling over 1.5 million pounds equivalent U_3O_8 were reported, but there were no conversion transactions in June.

The enrichment market strengthened during June as inventories declined further and the pace of activity continued to increase. The SWU Value increased a record five dollars, to $59 per SWU. Two near-term enrichment sales were reported totalling nearly 700 thousand SWU.

NATURAL URANIUM AND CONVERSION

The **Exchange Value** slid $0.15 (1.6%), to **$9.05** per pound U_3O_8 on June 30, 1991. Increased supply and limited demand, much of it discretionary, contributed to the market weakness. Buyers entering the market were met by determined sellers, and nine concentrates sales totalling 2.3 million pounds U_3O_8 were concluded.

Of the nine June concentrates sales, nearly all involved US sellers, and six of the nine buyers were US. A fairly even mix of utilities, intermediaries, and producers made the purchases, mostly from intermediary sellers. Eight of the nine deals occurred at price levels at or near the June 30 Exchange Value.

To date this year, 37 transactions have involved concentrates for a total of nearly eight million pounds, accounting for 58 percent of uranium market volume. Twenty-eight purchases for over 5.3 million pounds have been made by US entities. European, Australian, and Asian customers make up the balance. Buying has been fairly equally split between intermediaries, producers, and utilities, both in terms of volume and number of purchases.

The majority of concentrates sales have been concluded by intermediaries, accounting for 20 sales and 4.8 million pounds. Producers are next, with nine sales for over two million pounds. Most of the sellers have been from the USA, with 21 sales totalling 4.5 million pounds equivalent U_3O_8 in the form of concentrates.

* * *

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The June **UF_6 Value** declined $0.35 (1.3%), to **$27.25** per kgU as UF_6, as the UF_6 market reflected the weakening in the concentrates market. Only one UF_6 transaction was reported; a US utility purchased a small quantity at a price near the June 30 UF_6 Value.

Thirteen near-term uranium hexafluoride transactions have been concluded through the first half of the year, for a total of nearly 4.3 million pounds equivalent U_3O_8. Utilities have made nine of the purchases involving a total of 3.9 million pounds; intermediaries purchased the balance. The UF_6 volume has been almost equally split between European and US buyers, although US buyers made a higher number of purchases, but for lower average volume.

Intermediaries were the primary UF_6 sellers, supplying 3.9 million pounds in 11 of the 13 sales. US entities have accounted for 10 sales and 3.5 million pounds, while European entities made up the balance.

* * *

In the long-term market in June, three sales involving concentrates were reported. A utility purchased a total of almost two million pounds from three different intermediaries for delivery during the period 1994-1996.

Year-to-date, there have been 19 long-term natural uranium sales totalling almost 19 million pounds equivalent U_3O_8. All but two of the buyers were utilities; the others were an intermediary and a producer. Delivery schedules range from 1991 through 1998.

* * *

The **Transaction Value** decreased by $0.10, to **$9.20** per pound U_3O_8 based on 24 transactions over 3 months involving 6.3 million pounds equivalent U_3O_8.

* * *

Active uranium supply jumped by over four million pounds, to **11.2** million pounds equivalent U_3O_8. This increased supply was a major factor in June's softening uranium market. **Active uranium demand** also increased, edging up 295 thousand pounds, to **1.7** million pounds equivalent U_3O_8. The **supply/demand ratio** increased to **6.6 (Table 2)**.

The **Loan Rate** remained unchanged at **3.5** percent per annum. Two loans were reported during June: US entities borrowed a total of over 1.5 million pounds equivalent U_3O_8. In each case, the interest rate paid for the loans could be evaluated at a level near the June 30 Loan Rate.

A total of 5.8 million pounds equivalent U_3O_8 has been borrowed in nine natural uranium loans so far this year. Eight of the nine loans have had US borrowers; lenders have been from the USA, Europe, and Asia.

* * *

After rising slightly in May, the **Conversion Value** was unchanged on June 30, remaining at **$1.50** per pound U as UF_6. No conversion transactions were reported. Through the first half of 1991, there have been four long-term conversion sales totalling over 4.5 million pounds U for delivery during the period 1991-1997. There have also been five near-term sales for over 800 thousand pounds U as UF_6. Of the near-term transactions, four buyers and four sellers have been from the USA. The sellers have consisted of four intermediaries and a converter, while near-term buyers have included two utilities and three intermediaries.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• **Uranium** (thousand lbs equivalent U_3O_8)	11,180	1,695
• **Supply/Demand Ratio:**	6.6	
• **Loan** (thousand lbs equivalent U_3O_8)	4,530	0
• **Conversion** (thousand lbs U as UF_6)	700	0
• **SWU** (thousand SWUs)	380	310

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

Activity in the enrichment market continued to increase as the market strengthened throughout the month. The **SWU Value** rose five dollars, to **$59** per SWU. This is the largest single increase in the history of the NUEXCO SWU Value, which was first published on January 31, 1986. Two near-term SWU sales were concluded in late May and early June, involving a total of nearly 700 thousand SWU. The dwindling availability of low-priced SWU, combined with discretionary demand derived from long-term requirements, has caused the firming in the spot market.

Activity in the long-term SWU market remains intense. As many as 15 utilities, mostly from the USA, were evaluating enrichment supply alternatives during June. The current level of long-term prices has led many utilities to consider a number of supply options, including buy-and-hold strategies. With many utilities still evaluating alternatives at month-end, July could be a very active month in the enrichment market.

Through June 1991, there have been 18 near-term enrichment transactions totalling over 1.5 million SWU. Eight of the transactions have involved SWU contained in EUP. Of the 18 buyers, fourteen have been utilities; eleven US and three European. The other buyers include fabricators, enrichers, and intermediaries. Enrichment sellers also have been varied, with intermediaries, utilities, enrichers, and fabricators all having sold enrichment services so far this year. Despite all the recent long-term enrichment market activity, only one long-term SWU sale has been reported so far this year: a US utility purchased a moderate quantity of SWU from an intermediary for delivery during 1992-1995.

Table 3
ENRICHMENT PRICES
(June 30, 1991)

Prices	This Month Report 275	Last Month Report 274	12 Months Ago Report 263
NUEXCO SWU Value ($US per SWU)	59	54	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[2]	153.00[2]	153.00[2]
Requirements	157.00[2]	157.00[2]	157.00[2]
Incentive Price (IP2)[3]	100.68[3,6]	100.60[3,6]	90.00[4]
Calculated worth of enriched UF$_6$[5]: ($US per KgU as UF$_6$)			
2.0 w/o U^{235}	212	205	223
2.5 w/o U^{235}	294	284	306
3.0 w/o U^{235}	379	365	391
3.5 w/o U^{235}	466	447	478
4.0 w/o U^{235}	554	531	565
4.5 w/o U^{235}	643	616	654

[1] Effective 10/1/89 to 9/30/91.
[2] Effective since 10/1/84.
[3] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[4] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[5] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o U^{235} tails assay.
[6] IP2 price of $100.60 was a provisional price; after updates to GNPIPD values, the final IP2 price was determined.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5128	1991	Less than 50	98-102	Utility	Intermediary	UF_6
5129	1991	101-300	98-102	Utility	Intermediary	
5130	1991	Less than 50	98-102	Utility	Producer	
5133	1991	101-300	98-102	Utility	Intermediary	
5135	1991	101-300	98-102	Intermediary	Intermediary	
5137	1991	601-1,000	98-102	Producer	Intermediary	
5138	1991	Less than 50	98-102	Intermediary	Producer	
5140	1995	601-1,000	**R**	Utility	Intermediary	
5141	1996	601-1,000	**R**	Utility	Intermediary	
5142	1994	601-1,000	**R**	Utility	Intermediary	
5143	1991	**R**	103-110	Intermediary	Intermediary	
5148	1991	101-300	98-102	Intermediary	**R**	
5150	1991	Less than 50	98-102	Producer	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5136	1991	601-1,000	Above 110	Intermediary	R	
5147	1991	301-600	Below 90	Intermediary	Intermediary	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current – Conversion Value	Buyer	Seller	Remarks
No Conversion Sales are reported						

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5146	1991	301-600	90-97	R	Utility	
5149	1992	301-600	90-97	R	Utility	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
89-1054A*	3,430	—	1991 on	UF_6e
90-1078A	700	1,045 per year	1991-1993	UF_6e
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
90-1501	3,000	1,000 per year	1991-95	U_3O_8/UF_6
91-1060	100	—	1991	
91-1145*	520	—	1991	
91-1157*	100	—	1991	
91-1502	500	—	1991	
91-1503A	1,330	2,670	1991-1993	UF_6e
91-1505	500	—	1991	
TOTAL	**11,180**			
INACTIVE	**2,600**			
AVAILABLE FOR LOAN:				
ACTIVE				
91-1084	3,900	—	—	U_3O_8
91-1132*	100	—	—	U_3O_8
91-1146*	140	—	—	UF_6
91-1151*	390	—	—	U_3O_8
TOTAL	**4,530**			
INACTIVE	**655**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1230, 91-1034

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
INQUIRIES TO PURCHASE:				
ACTIVE				
90-1224A*	235	11,700	1991-2001	U_3O_8/UF_6/UF_{6e}
90-1304*	20	20 per year	1991-1994	
91-1010A	85	—	1991	UF_{6e}
91-1106	405	—	1991	
91-1112	160	—	1991-1992	U_3O_8/UF_6
91-1127A	390	—	1992	UF_{6e}
91-1138*	150	—	1991	U_3O_8/UF_6
91-1158*	250	—	1991	
90-1291	—	100 per year	1991-1995	
91-1014A	—	6,800	1992-2001	UF_{6e}
91-1017	—	300 per year	1995-2000	
91-1064*	—	460 per year	1993-1997	U_3O_8/UF_6
91-1094A	—	1,700 per year	1994-1995	UF_{6e}
91-1102	—	1,000 per year	1992-1995	U_3O_8/UF_6
91-1108	—	400 per year	1993-1997	U_3O_8/UF_6
91-1110	—	90	1992	UF_6
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1141*	—	500	1994	
TOTAL	**1,695**			
INACTIVE	**545**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1100A
Active Projects removed since last month: 91-1054, 91-1093, 91-1115, 91-1122

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6)		Delivery Period	Remarks
	Within 3 Years[1]	Beyond 3 Years[1]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	300	—	1991	
91-1501	400	—	1991	
Total	**700**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1103*	0	12,350	1993-1995	
Total	**0**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1078B	200	435 per year	1991-1993	UF$_6$e
91-1008	130	—	1991	
91-1032	50	—	1991	
90-1500	—	1,000	1991 on	
TOTAL	**380**			
INACTIVE	**1,685**			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1010B	20	—	1991	UF$_6$e
91-1127B	90	—	1992	UF$_6$e
91-1128	50	—	1991	
91-1150*	150	—	1991	
90-1144*	—	240	1995-2000	
90-1181	—	1,500	1996-2001	
90-1196	—	60 per year	1995 on	
90-1224B	—	1,920	1991-2001	UF$_6$e
90-1301	—	1,000 per year	1995-2000	UF$_6$e
91-1014B	—	1,770	1992-2001	UF$_6$e
91-1027	—	55 per year	1996-2000	
91-1063	—	15 per year	1995-1998	
91-1066	—	320	1995-2000	
91-1083	—	150 per year	1996-1998	
91-1094B	—	385 per year	1994-1995	UF$_6$e
91-1105	—	205	1996-2001	
91-1109	—	150 per year	1992-1996	
91-1113	—	710	1996-2000	
91-1120	—	120	1996-1999	
91-1121	—	50	1996-1998	
91-1131*	—	3,660	1995-2001	
91-1136*	—	120	1996-2000	
91-1142*	—	75 per year	1995-2000	
91-1152*	—	2,700	1995-2001	
91-1154*	—	285	1996-2001	
91-1155*	—	1,064	1996-1999	
91-1156*	—	300	1992	
TOTAL	**310**			
INACTIVE	**195**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1100B
Active Projects removed since last month: *none*

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)
Australia (dollar)	11.81	12.09	14.74	30.70	31.43	38.32
Belgium (franc)	337.31	329.63	398.63	876.93	856.97	1,036
Canada (dollar)	10.33	10.53	13.56	26.87	27.38	35.24
EC (ecu)	7.98	7.72	9.38	20.75	20.06	24.39
Finland (markka)	38.81	38.11	45.58	100.90	99.07	118.49
France (franc)	55.55	54.40	65.14	144.41	141.43	169.35
Germany (mark)	16.39	16.03	19.39	42.62	41.66	50.42
Italy (lira)	12,182	11,891	14,233	31,670	30,914	37,003
Japan (yen)	1,246	1,272	1,755	3,239	3,307	4,614
Netherlands (guilder)	18.47	18.06	21.83	48.02	46.96	56.76
So. Africa (comm. rand)	26.13	25.92	30.79	67.92	67.37	80.06
So. Korea (won)	6,555	6,664	8,201	17,042	17,326	21,320
Spain (peseta)	1,028	992.23	1,191	2,672	2,580	3,097
Sweden (krona)	59.19	57.46	70.22	153.88	149.39	182.55
Switzerland (franc)	14.06	13.65	16.48	36.55	35.48	42.84
Taiwan (dollar)	242.81	247.48	313.44	631.25	643.39	814.87
UK (pound)	5.57	5.42	6.67	14.49	14.09	17.35
US (dollar)	9.05	9.20	11.60	23.53	23.92	30.16

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 199)
Australia (dollar)	12.00	12.22	11.18	31.20	31.77	29.07
Belgium (franc)	342.90	333.21	302.41	891.46	866.28	786.19
Canada (dollar)	10.51	10.64	10.28	27.31	27.67	26.74
EC (ecu)	8.12	7.80	7.12	21.10	20.28	18.51
Finland (markka)	39.45	38.52	34.57	102.57	100.14	89.89
France (franc)	56.47	54.99	49.42	146.80	142.96	128.47
Germany (mark)	16.67	16.20	14.71	43.33	42.11	38.25
Italy (lira)	12,384	12,020	10,798	32,195	31,250	28,071
Japan (yen)	1,266	1,286	1,346	3,292	3,343	3,500
Netherlands (guilder)	18.78	18.26	16.56	48.81	47.47	43.06
So. Africa (comm. rand)	26.56	26.20	23.36	69.05	68.11	60.73
So. Korea (won)	6,664	6,737	6,221	17,324	17,514	16,174
Spain (peseta)	1,045	1,003	903.77	2,716	2,608	2,350
Sweden (krona)	60.17	58.09	53.27	156.43	151.02	138.49
Switzerland (franc)	14.29	13.80	12.50	37.16	35.87	32.50
Taiwan (dollar)	246.83	250.17	237.78	641.71	650.38	618.18
UK (pound)	5.67	5.48	5.06	14.73	14.24	13.16
US (dollar)	9.20	9.30	8.80	23.92	24.18	22.88

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[1] **As of May 1991 Report #273; calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* on the last business day of the month.**

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6			per kg U as UF_6		
	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)
Australia (dollar)	1.96	1.97	1.84	4.31	4.35	4.06
Belgium (franc)	55.91	53.74	49.83	123.26	118.49	109.85
Canada (dollar)	1.71	1.72	1.69	3.78	3.78	3.74
EC (ecu)	1.32	1.26	1.17	2.92	2.77	2.59
Finland (markka)	6.43	6.21	5.70	14.18	13.70	12.56
France (franc)	9.21	8.87	8.14	20.30	19.55	17.95
Germany (mark)	2.72	2.61	2.42	5.99	5.76	5.34
Italy (lira)	2,019	1,939	1,779	4,451	4,274	3,922
Japan (yen)	206.47	207.38	221.85	455.19	457.20	489.09
Netherlands (guilder)	3.06	2.95	2.73	6.75	6.49	6.02
So. Africa (comm. rand)	4.33	4.23	3.85	9.55	9.32	8.49
So. Korea (won)	1,086	1,087	1,025	2,395	2,395	2,260
Spain (peseta)	170.32	161.78	148.92	375.49	356.66	328.30
Sweden (krona)	9.81	9.37	8.78	21.63	20.66	19.35
Switzerland (franc)	2.33	2.23	2.06	5.14	4.91	4.54
Taiwan (dollar)	40.24	40.35	39.18	88.72	88.96	86.38
UK (pound)	0.92	0.88	0.83	2.04	1.95	1.84
US (dollar)	1.50	1.50	1.45	3.31	3.31	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay			UF_6 Value per kg U as UF_6		
	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)	This Month (June 30, 1991)	Last Month (May 31, 1991)	12 Months Ago (June 30, 1990)
Australia (dollar)	76.97	70.96	63.54	35.55	36.27	40.67
Belgium (franc)	2,199	1,935	1,718	1,016	988.89	1,100
Canada (dollar)	67.37	61.81	58.43	31.12	31.59	37.40
EC (ecu)	52.04	45.28	40.44	24.04	23.15	25.88
Finland (markka)	253.02	223.49	196.45	116.86	114.32	125.73
France (franc)	362.12	319.30	280.77	167.25	163.20	179.69
Germany (mark)	106.88	94.06	83.60	49.37	48.08	53.50
Italy (lira)	79,419	69,794	61,350	36,681	35,673	39,264
Japan (yen)	8,121	7,466	7,650	3,751	3,816	4,896
Netherlands (guilder)	120.41	106.03	94.11	55.61	54.19	60.23
So. Africa (comm. rand)	170.32	152.11	132.73	78.67	77.75	84.95
So. Korea (won)	42,735	39,116	35,348	19,738	19,993	22,623
Spain (peseta)	6,699	5,824	5,135	3,094	2,977	3,286
Sweden (krona)	385.87	337.29	302.66	178.22	172.39	193.70
Switzerland (franc)	91.66	80.11	71.02	42.33	40.94	45.45
Taiwan (dollar)	1,583	1,453	1,351	731.11	742.43	864.65
UK (pound)	36.33	31.80	28.76	16.78	16.25	18.41
US (dollar)	59.00	54.00	50.00	27.25	27.60	32.00

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[1] As of May 1991 Report #273; calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* on the last business day of the month.

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RECENT DEVELOPMENTS

Australia

In something of a surprise during its biennial conference in late June, the Australian Labor Party (ALP), ignored the recommendations of its own uranium policy review committee and voted to block any current expansion of Australia's uranium industry. Until recently it had been assumed, based on the review committee's findings and support for expansion expressed from such party luminaries as Prime Minister Bob Hawke and Treasurer John Kerin (formerly Minister of Primary Industries and Energy), that the restrictive three-mines policy would be effectively eliminated. Despite promising to speak in favor of such a change, Prime Minister Hawke did not participate in the debate, causing political observers to speculate that his silence on this issue was payment to the Left for their support during the recent leadership challenge mounted by Mr. Keating.

The practical effect of maintaining the current uranium policy is to defer, still further, the predeployment and premarketing efforts of such potential new mines as Denison's Koongarra in the Northern Territory, and CRA's Kintyre in Western Australia.

The situation regarding Pancontinental's Jabiluka deposit changed with the early July announcement that North Broken Hill Peko, the 65-percent owner of ERA, had purchased the Jabiluka deposit for A$125 million. Pancontinental will sell 100 percent of Jabiluka after exercising a 1987 option to acquire Texaco's 35-percent share for A$30 million. The transaction, which has been in negotiation for more than six months, will almost certainly result in the eventual processing of Jabiluka ore (estimated to contain more than 450 million pounds equivalent U_3O_8) at ERA's nearby Ranger mill. Although development of the ore body is not expected in the near future, this transaction clearly sets the stage for mining Jabiluka, even if the government's current uranium policy remains unchanged. This transaction also highlights the continuing consolidation of the uranium industry worldwide.

The ALP's decision to block any liberalization of its uranium policy at this time is unlikely to have any near-term commercial impact. The same, unfortunately, cannot be said about the longer term, for this action will once again focus buyers' attention on the continuing potential for government interference in Australia's uranium supply industry—raising politics as a security-of-supply issue.

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RECENT DEVELOPMENTS

USCEA

The International Enrichment Conference sponsored by the US Council for Energy Awareness was held in Washington DC, on June 23-26, 1991. The conference was well attended by industry participants and provided a focal point for the discussion of issues involving uranium enrichment activities in the world today. Papers were presented on topics such as the outlook for uranium enrichment, regulation and the environment, and the status of advanced technology development. In addition, panel discussions focused on the post-1995 market, and the restructuring of the Department of Energy's (DOE) Uranium Enrichment Enterprise. Highlights of some of the papers and discussions are presented below.

Uranium Enrichment Future: DOE's Perspective

Mr. William Young, DOE Assistant Secretary for Nuclear Energy, discussed the National Energy Strategy (NES) and emphasized nuclear energy's role as part of a balanced array of power sources necessary for meeting US energy needs. According to the NES, there is a need for US nuclear generating capacity to increase by 190 to 275 GWe by the year 2010, and to double by the year 2030 to meet projected energy demands. In order to meet these objectives, the first order for a nuclear plant should be placed by 1995, and the plant should be ready for operation by the year 2000. Mr. Young also discussed the uranium enrichment program and the commitment by DOE to be the foremost supplier of enrichment services in the Western World. He emphasized that a strong DOE sales base would allow DOE to maintain efficient diffusion plant operations and to continue the AVLIS (Atomic Vapor Laser Isotope Separation) deployment process. Mr. Young indicated that test data from AVLIS assures DOE that the cost for AVLIS will be 50-percent lower than the cost from other enrichment technologies.

Uranium Enrichment—A Look Ahead

A brief history of US government actions and policies toward uranium enrichment and non-proliferation was presented by Richard Kennedy, Ambassador-at-Large, US Department of State. According to Mr. Kennedy, the government's closing of the enrichment order books to new contracts during the mid-1970s was a major factor in creating the present market. This action prompted the creation of new foreign enrichment supply capacity and diminished the US government's image as a reliable source of enrichment supply. Since that time, the question of reliability has transformed the US government from a position of sole supplier of enrichment services, to a position of having about a 40-percent share of the world market. Regardless of whether the US nuclear program grows in the future, there will be a greater number of nuclear reactors in the world and the need for enrichment services will grow as well. Congress, therefore, must restructure DOE and reestablish it as a reliable supplier, thereby improving the government's influence in non-proliferation efforts.

Uranium Enrichment: A Success Today, An Asset for Tomorrow

Mr. Jean-Yves Barre, of Commissariat à l'Énergie Atomique (CEA) of France, discussed the future of uranium enrichment. He believes the prevailing buyers' market will continue until at least the year 2000. Contrasting with what looks like widely fluctuating enrichment policies in the USA, he believes that the scene in Europe shows good stability and a clear long-term view, with plans calling for Eurodif to remain in normal operation for at least 20 years. He observed that the development of advanced enrichment processes can then be carried out without haste, at a pace coherent with technological progress and adapted to forecasts on market demand. Following such a path would indicate that new capacities probably will need to come on line by the 2005 to 2010 timeframe.

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Regulation and the Environment: A Cogema Perspective

Mr. Arnaud de Bourayne of Cogema provided an interesting perspective to the solution of tails material buildup at the Eurodif gaseous diffusion plant. Presently Eurodif has 150,000 metric tons of depleted U as UF_6 produced since 1978. Since indefinite storage is not permitted at the plant site and no more than 50,000 metric tons is allowed to be stored, Cogema has constructed a defluorination facility and has begun to convert the tails material from UF_6 to U_3O_8. The facility has an annual capacity of 305 metric tons and essentially transforms the tails material to an inert form which can be compactly stored for future use or disposal. The cost of converting this material is about $4 per SWU, and is included in the price of Eurodif enrichment services.

The French Point of View on Laser Enrichment

Jean-Hubert Coates of Commissariat a l'Energie Atomique (CEA), stated that France is on schedule to build and operate an industrial prototype of the SILVA enrichment process by 1995. The French criteria for deploying a new technology is that deployment must be available by the end of the century, should be of modular design, must be highly selective (can accept reprocessed uranium feed), and that production cost be significantly lower than the present SWU price. Mr. Coates believes that the cost of producing SWU from SILVA will be about $60 per SWU and that the first plant module will be constructed during the years 2000 to 2005, with plant deployment during the 2005 to 2010 timeframe.

NRC Views on Regulation of Enrichment Facilities

An overview of the one-step licensing process for an enrichment plant was provided by Mr. Robert M. Bernero of the US Nuclear Regulatory Commission. He stated that the main criteria for an applicant under this process is a final design submitted up front, and an environmental impact statement completed in conjunction with the one public hearing to consider the issues. The result of this process will grant the applicant a construction/operation license. Mr. Bernero went on to discuss the Louisiana Energy Services application. He expects that the licensing of the facility will proceed on schedule, primarily because of the existing centrifuge facilities that exist in Europe and the extensive operating history and data that is available.

The First Enrichment License Application: An LES Perspective

Mr. Howard Arnold of Louisiana Energy Services (LES) described the organization of LES and the activities taken to facilitate licensing of the plant, permitting it to make its first delivery of enrichment services by 1996. Inherent design features, such as not using reprocessed uranium and producing only low-enriched material, are expected to reduce intervenor concerns during the hearing process. Much attention now, however, is being directed to gaining customer contracts to purchase enrichment services, so that LES can borrow funds for its construction financing. Once contract order books are filled, LES plans to start serious discussions with the financial community to put together a financing plan for the approximately US$800 million construction cost.

The Post-1995 Market: Who's Filling The Gap?

John Longenecker, chairman of the USCEA Enrichment Task Force, moderated a panel that addressed several questions involving the post-1995 enrichment market. The panel discussed how utilities would buy enrichment services in the future and what factors would be considered. A diverse opinion was expressed by panel members, with enrichment supplier representatives generally agreeing that enriched uranium product (EUP) will not play a major role in future utility fuel purchases. Other members of the panel suggested that EUP can offer good value and that utility purchase decisions would be governed by economics. Panel member Earl Hoellen of NUEXCO, emphasized that utilities will diversify product-form purchases because of the competitive market, and that as enrichment takes on the characteristics of a commodity, EUP will play a part in that transition.

On the matter of security of supply and price, the panel concluded that the question is the degree of risk utilities are willing to accept and at what price level that risk can be justified. With current levels of enrichment capacity, the risk may be minimal; however, suppliers noted that there

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is an uncertainty as to whether primary suppliers will continue to carry excess/uneconomic capacity. There is also a possibility that supply could decrease during the late-1990s, becoming more in balance with demand.

The panel's attention then turned to the role the Soviets may play in the market. DOE's position is that the Soviets should be a player based on free trade practices, that they should be pricing under a fair trade basis, and that there is risk associated with the uncertainty of Soviet supply because of changing governments. Other panel members pointed out that the Soviet entry into the market has made the market more competitive. The marginal cost of Soviet capacity, which comes from centrifuges installed over 20 years ago, is undoubtedly very low, and economics dictate that the lowest-cost supply will be used.

DOE's marketing of its incentive price offer and its effect on the market was also discussed. It was felt that DOE's offer at this time accelerated utilities' timing for making a decision on post-1995 purchases. However, other suppliers asserted that they are not driven by DOE actions, but by their own long-term strategies. Peter Jelinek of Urenco, believes that DOE's offer will not greatly impact the post-1995 market, since the offer is only for a short time period (1996-1998) and, therefore, would not affect what Louisiana Energy Services is offering.

The final portion of the panel discussion was devoted to the role new technologies may have on the market. It was generally agreed that advanced enrichment technologies will be used as a replacement for the current technology, but only when it is needed, has been proven technically, and is economically superior to the current technology.

Capitol Hill Roundtable: Restructuring the DOE Uranium Enrichment Enterprise

On Capital Hill, a special session took place that offered conference participants the opportunity to watch all the main players debate the issues surrounding DOE's initiative to restructure its enrichment program. The panel was composed of US Congressional committee staffers, DOE and Martin-Marietta staff, and Smith Barney and utility representatives. It was clear at the end of the session that although there is gridlock between the Senate and the House over the solution to DOE's problems, it is not caused by misunderstanding or lack of information about the problem. Most issues remaining to be resolved concern money, such as unrecovered costs versus "debt." An acceptable solution to maximize cash flow and limit the liability of the taxpayers has not been developed.

All of the participants agreed that if DOE is to be competitive in the long-term enrichment market, it must be restructured. However, not everyone agreed that DOE should be competitive, nor was there agreement on what type of restructuring is most effective, given the various groups' often incompatible goals. There does seem to be growing interest in the House to accept all liability and costs of the current gas diffusion plants, and simply attempt to license AVLIS in order to recover some money for the Treasury. Nick Timbers of Smith Barney pressed the argument that the main problem with privatizing AVLIS is that there is no way for a private company to evaluate both the technical and financial risks of deploying AVLIS. He feels the financial risks are manageable once the technical risks have been eliminated. The panel concluded without reaching a consensus.

The US AVLIS Program

An overview of DOE's AVLIS program was presented by Robert M. Feinberg of Lawrence Livermore National Laboratory. Mr. Feinberg described the major AVLIS systems that are now under construction and testing for demonstration in 1992. It appears that a three to six month delay may arise due to budget reductions and resulting schedule slippage. Should the demonstration be successful, however, AVLIS could be ready for commercial deployment with a small-sized plant of about four million SWU, operating as early as 1997 to 1999. A factory cost of about \$25 to \$50 per SWU is projected, which includes all capital outlays and depreciation. The maximum assay of the plant would be 5.0 w/o U^{235} with a tails assay of 0.1 w/o U^{235}. Mr. Feinberg emphasized that industry now has the means to provide U-metal feed for a four-million-SWU per year plant and estimated the cost of converting the U-metal product to UF_6 would be about \$4 to \$6 per SWU.

WASHINGTON FOCUS

by Linda L. Gunter

During June, the Senate considered several key pieces of legislation relevant to the nuclear industry. The Senate approved S 210, the Comprehensive Uranium Act of 1991, and the Senate Energy & Natural Resources Committee reported out S 1220 (previously S 341), the National Energy Security Act. The committee also approved S 1138 authorizing the Department of Energy (DOE) to begin characterization of Yucca Mountain as a spent fuel repository, despite the state of Nevada's refusal to issue environmental permits. The Senate Appropriations Committee voted on the Energy & Water Development bill for FY 1992. In the House of Representatives, the Energy & Power subcommittee began a series of hearings on national energy policy preparatory to drafting an omnibus energy bill. President Bush nominated E. Gail de Planque, a past president of the American Nuclear Society, to be the fifth Nuclear Regulatory Commissioner. If confirmed, she will replace Tom Roberts whose term expired last year. The NRC has been operating with only four Commissioners. With the Senate's confirmation of Ivan Selin as NRC Chairman on June 21, the NRC will be back to full strength shortly.

Enrichment Bill Passes Senate

◇ On June 12, the Senate unanimously passed S 210 for the fifth time in six years. Senator Wendell Ford (D-KY) said "We simply cannot allow this bill to die again in the House of Representatives. We can't afford to go on with business as usual. Time is of the essence, and I'm going to be doing all I can to see that my House colleagues get this message loud and clear." This bill is also incorporated as Title X of the National Energy Security Act (S 1220) which the Senate may vote on this summer. The House has shown little interest in the Senate's enrichment bill. However, if the House does pass an omnibus energy package, the issue may be addressed again during a conference with the Senate.

Energy Policy Bill

◇ S 1220 is a proposal for crafting a national energy policy. The act contains titles supporting advanced nuclear reactor commercialization, licensing reform, and restructuring of DOE's uranium enrichment program. The act has generated controversy because of provisions which address Corporate Average Fuel Economy (CAFE) standards, and allow opening of the Arctic National Wildlife Refuge, an action environmental groups oppose. A number of committees, including the Environment and Public Works committee, have sought jurisdiction over the bill, and therefore may delay the act's consideration by the full Senate.

Senate Approves Energy & Water Appropriations Bill

◇ The Senate Appropriations Committee approved its $[illegible]98 billion Energy and Water Development Appropriations bill (HR 2427). The bill includes $490 million more than the House version. The committee was more generous than the House with the nuclear programs in its jurisdiction. Nuclear energy R&D was funded at $346 million, $36 million more than the House bill, but still $52 million less than DOE's budget request. The advanced reactor R&D program received $59.5 million, $10 million more than the House bill. However, space reactor program funding was reduced by $12 million, to $44 million. The new production reactor program was funded at $483 million, $17 million less than requested and $54 million less than the House allocation.

The uranium enrichment program was allocated $1.367 billion, compared to $1.337 billion from the House. The Senate restored $30 million for funding the AVLIS (Atomic Vapor Laser Isotope Separation) program and specifically earmarked $20 million for pre-deployment activities. The report language criticizes DOE for "not providing the necessary leadership to assure that the USA benefits from the technology." The committee also said it is concerned "about the lack of

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direction and control of the AVLIS program and the apparent lack of an administration commitment to complete the technology demonstration." The report notes that the USA has a technical lead of 3-5 years over the competition and "failure to implement predeployment activities immediately will greatly increase the risk that the USA will lose the international lead position in uranium enrichment… Delay will also lead to cost growth. These effects will decrease the value of AVLIS technology in the marketplace and will substantially increase the difficulty of achieving the administration goal of privatization. Successful deployment of AVLIS may require significant private sector investment. Private sector investment is possible only if qualified firms have access to the technology and market information with sufficient lead time to work with investors to develop sound investment plans." Because of the differences in funding levels between the House and Senate versions of the bill, staff from both committees are expected to meet to resolve these differences prior to a Senate vote on its bill. A vote is now expected sometime after the July 4 recess.

Yucca Mountain Permits

◇ The Senate Energy Committee reported bill S 1138 which authorizes the federal government (Environmental Protection Agency–EPA) to issue permits the state of Nevada has withheld, so DOE may proceed with characterization of the Yucca Mountain high-level spent fuel repository site. The day after the vote, the Nevada Department of Environmental Protection issued two of the 18 environmental permits DOE has requested. But these permits are contingent upon a water quality permit which the state has not granted. EPA has testified it is not overriding state authorities, but feel it is imperative that the program move forward to determine if the site is suitable for the storage of high level nuclear waste. "It is not prudent to have nuclear waste stored at 111 sites across the country." Under a US District Court order, the state has until July 17 to respond to DOE's complaints.

S 1138 also repeals sections of the Nuclear Waste Policy Act related to the Monitored Retrievable Storage facility (MRS). To allow DOE to begin the selection process for an MRS host state, the bill uncouples the permanent repository from the MRS. Under the original bill, the government promised to begin accepting spent fuel from utilities in 1998. In order to maintain that schedule, DOE hopes to find an MRS host by 1992. The government's Nuclear Waste Negotitator, David Leroy, is seeking volunteer states. The Senate has chosen to separate the waste issue from the omnibus energy package because of its controversial nature. Energy committee staffers in the House, however, have indicated that if the House considers the issue, it will be as part of an omnibus energy package.

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INDUSTRY BRIEFS

France and South Africa To Sign NPT

As part of a new French global disarmament policy published on June 3, President Francois Mitterrand committed his country to signing the Treaty on the Nonproliferation of Nuclear Weapons (NPT). France's formal adherence to the treaty will leave China as the only recognized nuclear weapons state that has not signed the NPT. France is hoping that, following the announcement, China will also agree to sign the NPT. The French government did not announce a specific date for France's signing of the NPT, allowing China the opportunity to sign at the same time.

On June 27, South Africa announced that it will sign the NPT. Also, President F. W. De Klerk signed Parliament-passed bills repealing all legal racial segregation. However, a new constitution must be drafted and passed before these new laws can take full effect.

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ALP Conference Vote: Three Mines Policy Is Kept

The Australian Labor Party (ALP), the ruling party in Australia, voted at its national conference in late June to maintain its three mines policy. This policy permits only three mines to operate—the Olympic Dam and Ranger mines, plus Nabarlek, which completed mining in 1988. (*See* Recent Developments *on page 13 for more details.*)

Canadian-Italian Consortium To Complete Romanian Unit

Atomic Energy of Canada (AECL) and Ansaldo S.p.A., an Italian engineering firm, agreed to create a consortium that will complete Romania's Cernavoda 1 unit. The ultimate plan is for the Cernavoda station to have five units. AECL will supply the CANDU nuclear steam supply systems, while Ansaldo will be involved in the remainder of the plant. AECL and Ansaldo have a contract worth approximately US$360 million with Romania's nuclear agency, RENEL, for the reactor's completion. However, the contract is contingent on Canada's Export Development Corporation approving a US$240 million loan. Ansaldo would arrange financing for the balance of the contract amount.

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German Utilities Part Owners of New French Nuclear Plant

PreussenElektra, Bayernwerk, and RWE Energie AG together will purchase a 25-percent share in a joint subsidiary that will own one (or more) of EdF's planned 1,400 MWe units at the new Civaux station. This ownership is in return for Germany's allowing EdF to purchase a 15-percent interest in VEAG, the electric utility for Eastern Germany. These three German utilities had hoped to gain a share in EdF itself, but encountered strong political and labor opposition to foreign utilities sharing in EdF.

Rio-Hydro Contract Revised

On June 17, Ontaro Hydro's new chairman Marc Eliesen announced that, following negotiations with Ontario's New Democratic Party-controlled government, Ontario Hydro and Rio Algom had agreed to revise the termination date of Hydro's long-term uranium contract with Rio. Under an economic obsolescence clause, the utility could have cancelled deliveries after 1993. Deliveries now will continue through mid-1996, and the quantities will be increased. Hydro will still pay the original contract's above-market price for the 3.7 million pounds equivalent U_3O_8 of uranium to be delivered from now to mid-1993. However, the utility will pay a fee much closer to market price for an additional 5.9 million pounds above the original contract. In addition, Ontario Hydro will provide a C$250-million contribution to the Elliot Lake economy.

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Japan's MITI Issues Permits For Construction of 2 GE ABWRs

Japan's Ministry of International Trade & Industry (MITI) recently issued establishment permits to Tokyo Electric Power Co. that allow it to begin construction of Kashiwazaki 6 and 7. The units, designed and supplied by General Electric, will be the world's first advanced boiling water reactors.

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NUEXCO

THE URANIUM INDUSTRY OF BULGARIA

For 45 years, the Bulgarian uranium industry operated behind an impenetrable veil of secrecy. As this veil is slowly lifted, the breadth and structure of the industry are becoming apparent—and so are the problems.

Bulgaria's uranium industry began in 1945 with the evaluation of several uranium mineral occurrences in the Balkan Mountains. These occurrences proved to be mineable deposits and became the foundation for a continuing program of exploration and development. Mining commenced in 1946, and all production was exported under contract to the Soviet Union in exchange for an eventual supply of fabricated nuclear fuel. In concert with most other countries of the COMECON block, Bulgaria's exploration and development program reached its zenith in the late 1960s and early 1970s. Like other COMECON countries, the contract with the Soviet Union was reduced during the 1980s and finally terminated.

The Bulgarian uranium industry now is under substantial pressure to:

- Maintain uranium production as a base of support for its 10,000 employees.
- Develop mineral deposits other than uranium as a replacement for high-cost uranium production.
- Clean up past and present production sites, most of which have significant environmental problems.

The probability of successfully completing these three tasks without outside assistance is limited. Bulgaria's almost complete dependence for four and a half decades on Soviet aid, contracts, and technology has taken its toll.

STRUCTURE

The Bulgarian uranium industry is operated and administered by Redki Metali (Rare Metals), an enterprise created in 1989 on the basis of new legislation passed by the parliament. It is the successor organization to the original state enterprise formed forty years ago.

Redki Metali operates through a number of divisions, including: conventional mining operations, in-situ leaching facilities, a prospecting division, an equipment service and repair organization, a research and development group, a housing/food division, a domestic commercial enterprise group, and an international trade group.

Similar to many mining enterprises around the world, the firm provides most of the housing for its employees. In contrast, however, Redki Metali also provides the bulk of its own food, at no cost to its employees. The employees are now represented by a union and receive a wide range of social and recreational benefits including their own ski area.

GEOLOGY AND GEOGRAPHY

Bulgaria is situated near the southeast corner of the European Continent (**Figure 1**). It covers an area of 43,100 square miles (112,000 km^2), slightly larger than the state of Ohio in the USA. It is bounded on the north by Romania, with the Danube River along most of this border. To the west is Yugoslavia; to the east, the Black Sea; and to the south are both Greece and Turkey. Bulgaria's population is nine million people, with the capital and largest city, Sofia, containing about one million citizens.

Geologically, the country is on the eastward extension of the Alpine Fold Belt, best known for its mountainous expression, the Swiss Alps. This belt is a major feature of southern Europe and is the result of compressive forces acting on different large land masses that have come together to form the continent. In the area of Bulgaria, three different tectonic plates exist. The northern third of the country is known as the Moesian Plate and is made up mainly of folded older sediments and metamorphic rocks. At the southern edge of this plate, the Balkan Mountains extend east-west across the country. The southwest portion of the nation is underlain by a thick section of old basement rocks with many faults and later volcanics known as the West Rhodope. The southeast portion of Bulgaria consists of a thick section of older sediments and volcanics known as the East Rhodope. Major fault systems exist between these plates and, to a lesser extent, inside them. The Plovdiv Basin occurs along an east-west line between the northern plate and the two southern plates. This basin is filled with younger sediments and thickens to the east, towards the Black Sea.

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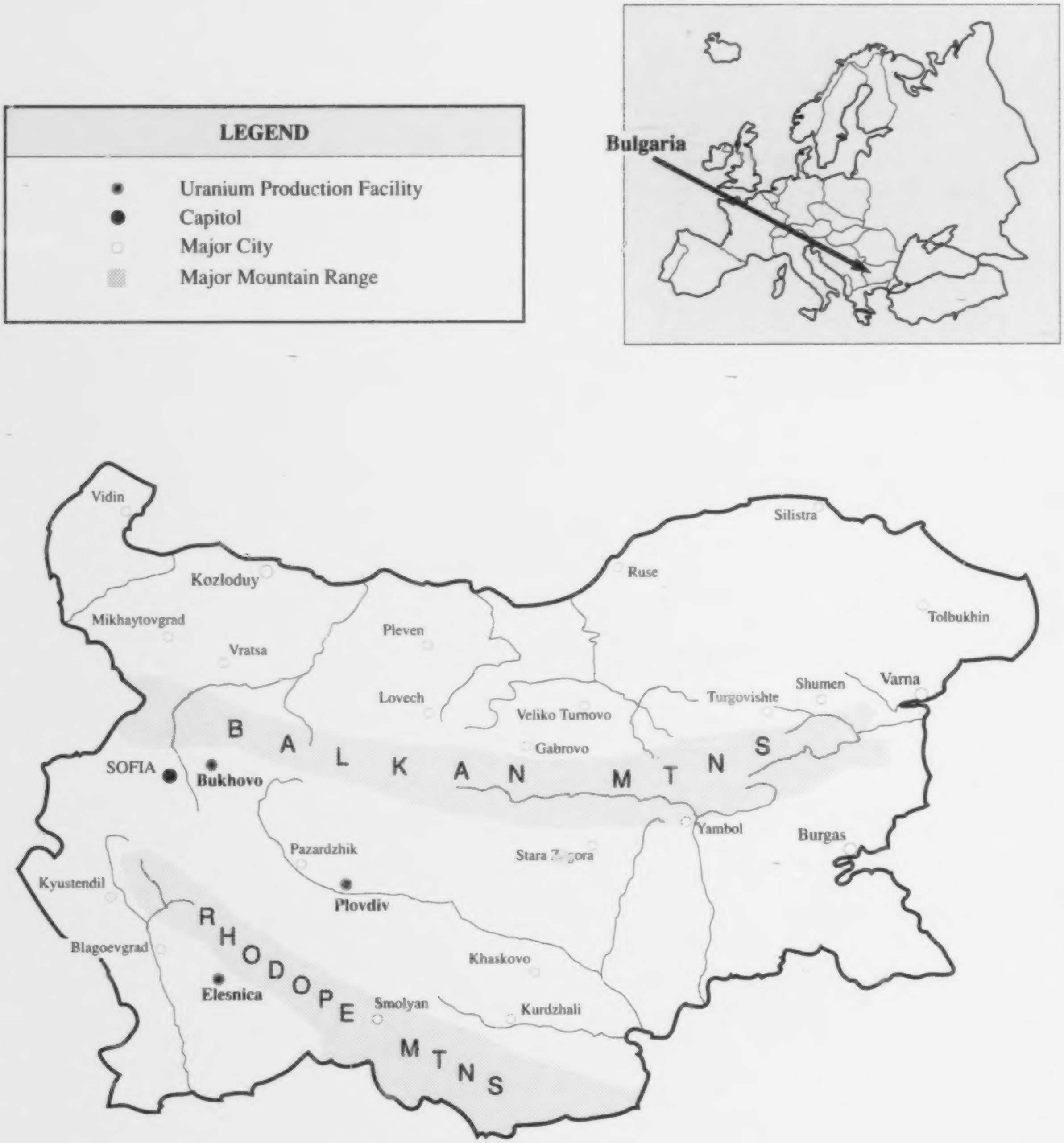
Figure 1
URANIUM PRODUCTION FACILITIES AND MAJOR CITIES OF BULGARIA


LEGEND
● Uranium Production Facility
● Capitol
○ Major City
▨ Major Mountain Range
Bulgaria
Vidin
Silistra
Kozloduy
Ruse
Mikhaytovgrad
Pleven
Tolbukhin
Vratsa
Shumen
Varna
Lovech
Turgovishte
Veliko Turnovo
Gabrovo
B A L K A N M T N S
SOFIA
Bukhovo
Yambol
Burgas
Pazardzhik
Stara Zagora
Kyustendil
Plovdiv
R H O D O P E M T N S
Blagoevgrad
Khaskovo
Elesnica
Smolyan
Kurdzhali

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Bulgaria is located along the ancient migration path between Europe and Asia Minor and has a mining history dating from prehistoric times. Currently, it produces most of its own mineral requirements and has a broad industrial base. Major resource trade items include imports of iron ore and petroleum from the Soviet Union, and the export of manufactured products to eastern Europe. A good system of roads and railroads connects Bulgaria to both Europe and Asia. The ports of Burgas and Varna on the Black Sea provide outlets for international trade with Romania, Turkey, and the Soviet Union.

PRODUCTION CENTERS

Redki Metali maintains three uranium production centers: Bukhovo, Elesnica, and Plovdiv (**Figure 1**). The combined production capability of these centers is approximately two million pounds U_3O_8 per year. The current production rate is slightly more than one million pounds U_3O_8 per year.

Bukhovo

The Bukhovo uranium production center includes the headquarters of Redki Metali and a conventional uranium mill. It is located only 20 kilometers northeast of Sophia and has acted as milling center for a series of mines up to 100 kilometers away, including Proboinica, Gaber, and Senekos. Many of these mines are located in the Balkan Mountains on the periphery of a syenite intrusive. The uranium deposits of this region are hosted by carbonaceous Silurian schists transected by lamprophyre dikes, and occur as irregular veins or stockworks where pitchblende has been deposited in breccia zones. Mining has been largely by underground methods.

The first extraction plant at the Bukhovo site was built in 1949. It was replaced by a sorption-type plant in 1956 which operated until 1989. A new sorption plant was commissioned in 1989, but only operated on a trial basis for about five months. It was closed in 1990 for environmental reasons, including excessive dust from dry grinding. At present, the plant is officially classified as "on standby", but current efforts seem to focus on its use for processing other minerals such as molybdenum, tungsten, and vanadium.

The design capacity of the Bukhovo plant is 600 thousand metric tons (tonnes) of ore per year with an output of about one million pounds U_3O_8 per year. The plant has both an acid and an alkaline circuit, as well as a flotation section to remove sulfides (**Figure 2**). The acid side can treat 400 thousand tonnes of ore per year; the alkaline side, 200 thousand tonnes.

Mine-run ore is transported to Bukhovo by rail and hauled from the rail siding to the top of the gravity-feed mill by truck, where it is dumped through a 300-millimeter grizzly sizing grate. A conveyor moves the ore to a 5-meter diameter semi-autogenous grinding (SAG) mill. The SAG mill

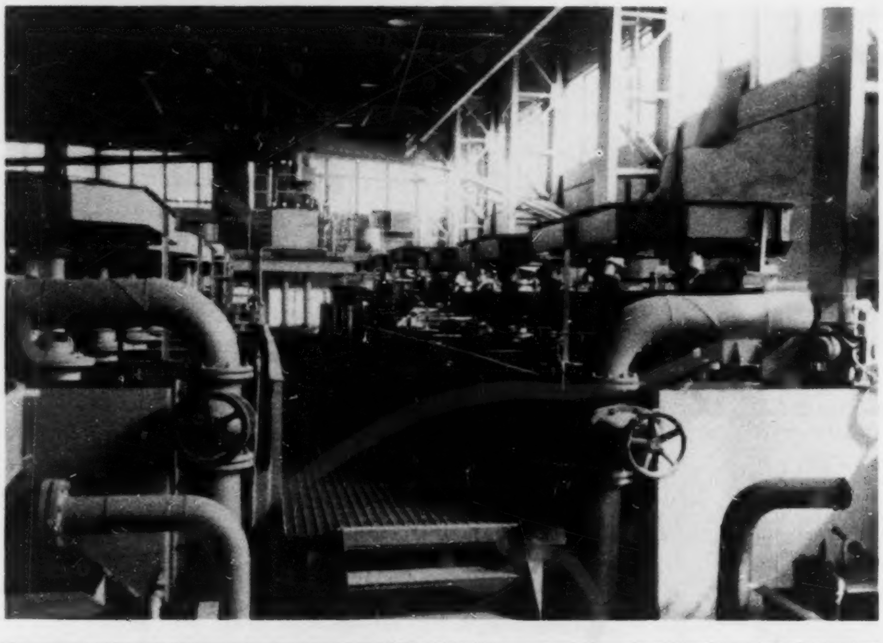

Figure 2 — The flotation section for removing sulfides at the Bukhovo uranium production center.

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discharges through a trommel, with the +20mm fraction being fed to a cone crusher, and the undersize fraction, directly to a fine ore bin.

At this point, the acid and alkaline circuits diverge to separate 42m^3 ball mills, operated in closed circuit with classifiers. Acid-amenable ores are ground to 60 percent minus 200 mesh. The ball mill discharge is fed to a peripheral-drive thickener, 30 meters in diameter, where the pulp is thickened to a density of 1500 grams per liter (g/L) in preparation for leaching.

The hydrometallurgical recovery process includes the following steps: sorption, extraction, concentration, uranium precipitation, and calcining. The sorption section of the hydrometallurgical plant includes twelve 16m-high, 4m-diameter, rubber-lined, air-lift Pachucas in the acid circuit. Sulfuric acid, manganese dioxide, and ion exchange resin are mixed with the pulp. Contact time in the countercurrent system is four to six hours. The ion-exchange resin (both Hungarian "Varian" and Soviet "AMP" are used) is loaded to about 15 kilograms U per cubic meter and stripped with concentrated (120g/L) sulfuric acid in regeneration columns, which measure 2.38m in diameter and 16m in height. The resulting pregnant solution has a uranium concentration of 2.0 to 2.5 g/L. Residual loading of the resin is about 1.0 kg/m^3.

The alkaline circuit operates in similar manner but with two thickeners, ten Pachucas operating at 80°C, and twice the contact time. Uranium recoveries are about 10 percent lower than in the acid circuit.

The pregnant solution is concentrated in a four-stage solvent extraction process with a 1:1 aqueous-to-organic ratio, and with 0.15 gram moles extractant in kerosene. Uranium is stripped from the organic with ammonium carbonate, precipitated and dried at 700°C, to produce U_3O_8.

On an overall basis, the plant requires 100 kWh electricity per tonne of ore and has an operations staff of 300 to 350 employees.

Elesnica

The Elesnica uranium production center is located about 120 kilometers south of Sophia near the town of Bansko, a scenic winter sports area. This production center has exploited a number of related open-pit and underground deposits, the first of which was discovered by airborne radiometry in 1954. Mining commenced in 1955 on an open pit deposit; it was exhausted in 1960, but deeper drilling identified a richer underground ore body containing about 3.1 million pounds equivalent U_3O_8. Continuing exploration located additional ore bodies, allowing uninterrupted production through the present. The production rate has been as high as one million pounds U_3O_8 per year; current production is at a rate of 390 thousand pounds per year.

Ore deposits in the Elesnica district occur in a graben environment of fluvial sandstones of Oligocene age. The sandstone series is over 1,200m thick and includes six major depositional sequences, all derived from the nearby Rila and Pirin Mountains. Each of these sequences exhibits a basal breccia overlying the fine, upper sediments of the previous layer. The ore bodies are flat-lying and irregular, and occur at several levels within the depositional sequence. Ore grades are generally less than 0.10 weight-percent (w/o) U and original resources of the district totalled almost 26 million pounds U_3O_8.

Uranium mining at Elesnica is currently focused on one underground mine served by a main hoisting shaft 660m in depth. This mine is interconnected with several others through an extensive network of levels and shafts. Ore production is now about 200 thousand tonnes per year, 90 percent of which is derived from underground mining.

The mine has been developed by a series of six horizontal levels at 40m spacing. Current production levels are about 360m in depth (560m above sea level). The mining method is selective room and pillar, with slushers used almost exclusively in the stoping areas. Ore is slushed into 1.0m^3 rail cars that are trammed to the shaft, hoisted to the surface, scanned radiometrically, and automatically dumped to the ore or waste side of the headframe. The cut-off grade is 0.02 w/o U for underground mining, 0.01 w/o U for surface mining.

Water inflow to the mine equals about 1,100 gallons per minute, all of which is discharged after treatment in sedimentation ponds and ion exchange columns. This inflow has a uranium content of 3-4 parts per million (ppm), most of which is recovered in the treatment process. The ventilation capacity of the concrete-lined main shaft (5.5m in diameter) is 250,000 cubic feet per minute, but the ventilation rate is decreased in the winter because there is no means of heating the air.

The Elesnica hydrometallurgical plant operates in a similar manner to the Bukhovo plant, but has only an acid leach circuit. Following primary and secondary crushing, the ore is ground in ball mills to minus 70 mesh and transferred to Pachucas where it is leached with sulfuric acid in two stages. Ion exchange resin is added to the second stage Pachucas and regenerated with strong acid (120g/L) in 10m x 1.6m columns. Resin losses amount to 280cm^3/tonne

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of ore. The ammonium uranyl tricarbonate precipitate is calcined to produce a U_3O_8 product. Acid consumption is a relatively low 30kg/tonne of ore, due to the high silica content of the ore. Elesnica also treats loaded resin trucked from Redki Metali's in-situ leaching (ISL) operations in the Plovdiv area.

Employment at Elesnica totals 1,400 workersfor the mine: 800 work underground and the remainder work on logistics and at support facilities, including the town site. An additional 300 are employed at the hydrometallurgical plant. Take home pay amounted to about 1,000 leva per man-month in April 1991, or about US$65 at then-current exchange rates. Typically, the miners work from five to eight years underground, and then on the surface until retirement at age 45. All uranium miners qualify for 42 days of vacation per year.

Plovdiv

Redki Metali operates an extensive network of in-situ leaching facilities in the Plovdiv area. These facilities include 14,000 wells in fifteen well fields, four satellite recovery units, and one resin enrichment unit. Current production from these facilities amounts to approximately 800 thousand pounds equivalent U_3O_8 per year.

Uranium ore bodies of the Plovdiv area occur in buried channels cut into fine-grained Pliocene sandstones. The productive horizon varies in thickness from 10 to 50 meters, while the ore zones range from 30 to 40 centimeters to 3 to 4 meters in thickness. Clay overlies the sandstone and serves as a confining layer to the well-field solutions. Disequilibrium is common.

ISL operations are based upon a hexagonal wellfield pattern with spacings of 20-25 meters between wells. The average well depth is 250m. Sulfuric acid with a strength of 7g/L is injected into ore horizons; the strength of the recovered solution is 3g/L. Overall acid consumption is 430kg of acid per kgU. Uranium concentrations in the recovered solutions average 10ppm and the cut-off point is 4ppm. Injection pressures are 85 pounds per square inch. Well construction techniques are similar to those in the US, with the use of PVC (polyvinyl chloride) pipe and screens, but air lifts are used instead of pumps. Energy and acid costs account for 20 and 30 percent of the total production costs, respectively.

Recovered well-field solutions are piped through collection headers to the satellite recovery facilities (**Figure 3**). These facilities use an ion exchange system and achieve loadings of about 15kgU/m^3 of resin. The loaded resin is trucked to a central enrichment facility where it is stripped under strong-acid conditions and reloaded in dilute-acid conditions to 35-40kgU/m^3. The loaded resin is trucked to Elesnica for final recovery.

Significantly, at least one of the satellite facilities of the Plovdiv ISL operation produces an NH_3AlSO_4 by-product through the use of a German resin. This aluminum recovery circuit is physically several times the size of the uranium recovery circuit.

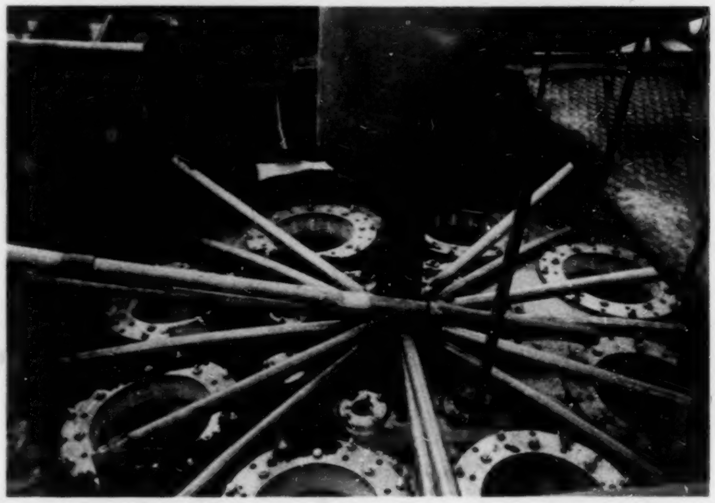

Figure 3 — An ion-exchange contactor at a satellite uranium recovery plant in the Plovdiv in-situ leaching uranium region.

Conclusion

As with most former COMECON countries, Bulgaria's uranium industry was once vibrant and productive, and operated with a high priority from the government to receive equipment and supplies as a favored industry. However, an increasingly powerful "green" movement, cancellation of the agreement to supply the Soviet Union, low prices, and high costs are likely to severely restrict, if not terminate, uranium production in Bulgaria. Now, efforts are aimed at converting production capacity from uranium to other metals, providing a basis for cautious optimism.

Thomas C. Pool

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SPEECH

THE PRESENT AND FUTURE OF NUCLEAR ENERGY AND INDUSTRY IN THE USSR

The following article is an edited version of a speech presented by Vitaly F. Konovalov, Minister of the Soviet Union's Ministry of Atomic Energy and Industry. Mr. Konovalov presented the speech on April 8, 1991 to the 24th Annual Conference of the Japan Atomic Industrial Forum in Tokyo, Japan.

Nuclear power plays an important role in Soviet energy production, even though its share of total energy production is relatively small. First of all, nuclear power makes a major contribution to the energy mix of the country's industrial regions: 33.1 percent for the North-West integrated power system, 22.7 percent for the Ukrainian system, 21.7 percent for the Central, and 16.7 percent for the Volga region. At the same time, considering the total number of nuclear power units in operation in the USSR and their combined capacity, the USSR is the third in the world after the USA and France.

As of January 1, 1991, fifteen nuclear power stations had 46 units in operation with total power of 36,560 MWe. In 1990, they produced 211.5 billion kWh of electricity, 12.5 percent of all the electricity generated in the USSR. Almost 70 percent of the Soviet Union's electricity is produced by fossil fuel plants using coal, oil, or gas; about 18 percent is produced by hydropower stations.

For the long-term, needed increases in energy production must come primarily from natural gas and nuclear power, for a number of reasons. In the European part of the USSR one can expect no significant increase in power production by coal-fired power plants. Already the average distance for fuel transportation from the East, to central regions and the Urals is about 4,000 kilometers, and fuel makes up about 40 percent of all the cargo. At the same time, the ecological burden of the coal plants (primarily air pollution) and high capital investments to reduce it to acceptable levels in the densely populated European part of the USSR make coal plants non-competitive in this region.

Due to the limited reserves remaining in the developed oil fields, the cost of oil production by the year 2000 is expected to increase by 1.5 to 1.8 times, and by 2010, by 2.0 to 2.5 times. Thus, in the coming years, the use of oil products as fuel for boilers will become economically unjustified.

However, the availability of huge natural gas reserves gives the Soviet Union the opportunity to satisfy substantial portions of its future energy needs. In the next 30 to 40 years, the power plants and boiler houses using natural gas will become a viable alternative to other fossil fuels and nuclear power plants, especially in the European part of the country.

The use of natural gas will be limited somewhat by transportation costs. The average distance for gas transportation has increased from 530 km in the 1950s, to 2,400 km at present, and that trend can be expected to continue. While natural gas is vital to the country's future energy mix, it cannot do the job alone.

Thus, from the point of view of the Soviet national economy, giving priority to the development of nuclear power in the European part of the USSR is absolutely imperative. Nuclear power is also favored on ecological grounds. The development of the nation's fuel and power production complex must pursue not only economic, but ecological requirements, and should be socially acceptable for the respective regions and the society as a whole.

The use of fossil fuel in power production is accompanied by significant releases (discharges) of contaminants in the environment, and this leads to well-known consequences, not only for the localities or regions, but for the whole world. The global influence includes the change in the thermal balance of the earth due to carbon dioxide and dust.

Nuclear power is free from several drawbacks of the fossil fuel power industry, because it does not produce aerosols or cause irreversible consumption of oxygen from the atmosphere. There are no toxic chemicals, and the uranium fission reaction requires no oxygen. The radioactive contamination of the environment and possible exposure of the population during normal operation of a nuclear power plant are much lower than sanitary and hygienic limits. Thus, the conclusion is that both from an economic and ecological point of view, it is necessary to use and develop nuclear power in the USSR, especially in the European part.

In order to understand the present state of nuclear power and its supporting infrastructure in the USSR, as well as the prospects of their development, we will briefly consider the historical aspects.

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By the end of the 1960s, the USSR had developed its nuclear power industry based on two types of reactors. One was a well-known pressurized water reactor, that was first used by nuclear states to power submarines (VVER). The other type was an original Soviet design of the graphite-moderated reactor (RBMK), which is similar to commercial reactors utilized by some countries for plutonium production. The selection of the second reactor concept for the development of the power industry was based on the difficulties in large scale production of heavy power-generating equipment, particularly vessels for pressurized water-type reactors.

The industrial infrastructure supporting the nuclear fuel cycle was formed in this country for defense purposes and was well developed to include mining and processing of natural uranium, production of hexafluoride and separation of uranium isotopes, production of fuel assemblies, and radio-chemical reprocessing of spent fuel.

Plans for future development of the Soviet power generation program were made public in the beginning of the 1980s and provided for:

- Rapid growth of nuclear power, so that by 2000 the combined capacity of all nuclear power plants would be 190,000 MW, and the total electricity generated by nuclear reactors would reach 1,100 million MWh, out of the total production in the country of 2,700 million MWh.
- Principal expansion of nuclear power's application for areas of industrial and district heating.
- Dynamic development of fast breeder reactors to provide nuclear power with fuel for a long period of time.
- Development of low-power nuclear facilities for remote and almost inaccessible regions, as well as for the merchant nuclear fleet.

On the basis of these plans, the country started to renew the equipment and to develop new capacities for supporting industry.

The commissioning of the Soviet Union's largest heavy-machine building plant at Volgodonsk (ATTOMMASH) was one of the key steps in the development of the necessary industrial infrastructure. This industrial enterprise was provided with all the necessary equipment for the production of highly sophisticated equipment weighing up to 600 tons.

By the middle of the 1980s, a well-developed infrastructure of the nuclear power industry was established in the country. From 1981 to 1985, seventeen power units with a total capacity of 15,800 MW were commissioned. During that period, the Soviet Union developed for commercial use the biggest power unit in the world—a 1,500 MWe RBMK. Work had also begun on the first units of district heating nuclear plants (DHNP).

Before the Chernobyl accident, the need for predominant development of nuclear power was of little doubt to the majority. But reaction to the accident has brought a considerable change in public attitudes. Society started to actively oppose further development of nuclear power and even operation of existing nuclear plants. The first result of the negative approach was drastic cuts in the plans of introducing new power production capacities. Recently, 100,000 MW of nuclear power plants were abandoned at different stages of design or construction. Soon after the earthquake in Armenia, the Armenian nuclear power station was shut down.

But it should be noted that lately, in a number of regions, one can see a tendency toward understanding the need for nuclear power, especially among people with influence on decision-making. Judging by that, good reasoning should ultimately win. As an example, the decisions of the Soviets of people's deputies in Voronezh, Kursk, Murmansk, Chelyabinsk, Semipalatinsk, Chimkent, and Eastern Kazakhstan regions favored the construction of new power units (more than 12,000 MW in total).

Naturally, the changes taking place in the country led to reductions in the power production program; current plans call for the installation of 7,000 MW of capacity during the period 1991-1995, and 12,600 MW during the next five-year period. In this case, by the year 2000, the total installed power of the nuclear plants in the country will amount to 57,000 MW, without taking into account decommissioning. For the period after 2000, the predicted increase in the rate of construction is such that, by 2010, growth in the installed power shall be 150,000-200,000 MW, with due account for decommissioning of units which have reached the end of their service lives. The final decisions are not yet taken. They will be reflected in the new national nuclear power program, with due account for the necessity of increasing installed power in the national integrated power system, decommissioning of units which exceeded their service life, and structural changes in the national economy.

The construction of nuclear power plants in the coming ten years will be on the basis of VVER-1000 reactors having enhanced safety performances. These improvements will be, to the maximum possible extent, introduced in the nuclear plants in operation or under construction.

After 2000, the power stations under construction shall have new-generation commercial units with enhanced safety (type VVER-92, VVER-500, VPBER-600, and FBR). These will be realized by the year 2000 on the basis of previous designs and from 30 years of experience in the field of nuclear power.

Thus, two important stages may be marked in the strategy of nuclear power development that meet the requirements of acceptable risk:

- 1990-2000 may be considered a "renovation" stage with the introduction of new units with enhanced safety, and with a low rate of increase in the total power produced by nuclear. This should be a period of extensive R&D to form the scientific and design basis for future intensive development of nuclear power.
- 2000-2010 is the stage of dynamic increase of power production using the new generation of nuclear units having better economic features and enhanced safety.

Due to the fact that the first stage is characterized by an insignificant increase in the overall power generation by nuclear plants, the supporting nuclear industry of the USSR, which was developed to realize a larger power production program, has fundamental excess capacity during the first stage, that is, for the balance of this century.

So, there is a possibility to modernize a number of production enterprises in the nuclear fuel cycle and switch over to new technologies, ensuring better protection of the environment and more complete use of uranium ores. The present Soviet technology allows segregation of byproducts, such as molybdenum, rhenium, scandium, vanadium, gold, rare earths, and other valuable elements, all of which can be sold on the world market.

A progressive method of underground leaching is being widely introduced in uranium mining. This new method allows mining of the reserves of depleted uranium ores at different depths and in complicated rock conditions. Plans are to produce up to 40-50 percent of uranium by this method by 1995. Taking into account previously accumulated resources of uranium ore, the amount of the available raw material allows us to ensure supply for nuclear power plants with total power of about 100,000 MW, including the existing capacities for separation of uranium isotopes. It is worth mentioning that the separation process in the USSR is based on the use of gas centrifuges. In the USSR, there has been adopted the closed nuclear fuel cycle concept envisaging the reprocessing of spent fuel. This method ensures complex use of valuable components and getting the least amount of wastes for final disposal. A plant for reprocessing spent fuel has been put into service in our country; the second one is being constructed. The national experience has proved the economic feasibility of the chosen concept.

The second stage in nuclear power development in the USSR is tied up with a new generation of reactors and power plants which will be the logical continuation in the development of Soviet reactors designs, fully realizing the experience and using technical means of "accident management." Once the present-day safety concepts are in action, the probability of severe damage of the core is not over 10^{-6} per reactor-year.

According to Soviet experts the ideology of enhanced reactor safety incorporates the following postulates:

- Succession of the nuclear power programs and concepts ensuring safety.
- Inherent self protection of the reactors (due to inherent negative feedback in the core).
- Primary use of passive means of protection and emergency cooling, requiring no external energy or operator actions.
- Required redundancy of protection and cooling means.
- Representative justification of the sufficiency of the designed protective barriers for possible radioactive product releases in maximum design-base and hypothetical (physically possible) accidents.
- Availability of information backup and protection from operator errors.

The above principles were implemented in designing the ACT-500 district heating nuclear plants, which allowed them to be located close to the boundaries of such cities like Voronezh and Nizhny Novgorod. An IAEA mission of experts studied the design of ACT for Nizhny Novgorod and the construction activities there, and confirmed the high level of ACT-500 safety, novelty, and soundness of technical solutions.

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The next important aspect in ensuring realization of the second stage of nuclear power development is the solution to the nuclear waste management problem. The related national technical policy developed in our country is now under consideration. The policy provides for a comprehensive solution to the problem of nuclear waste from operating nuclear power plants, nuclear plants under construction, and those at the design stage. It establishes norms for the amount of nuclear waste produced, procedures for its collection, logging and accounting, transportation, temporary storage, preparation for long-term storage, and final disposal with reliable isolation of the waste from the biosphere.

The biggest amount comes from low- and medium-level wastes. And still, for these types of waste, there are no principal problems either in the process or in the economics. The technology, adopted in the USSR as well as in other countries, reduces the volume of such waste by evaporation, compression, burning different sorts of wastes, and their solidification (cementing or bitumizing) with rather low degree of leaching—not more than 10^{-3} to 10^{-4} g/cm^2 per day. We have a well-developed technology for disposing of such waste in isolated near-surface or shallow storages, which ensures isolation of radioactivity from the ecological system.

The main and the most complicated matter in practical handling of nuclear waste is handling high-level nuclear waste. The situation with such waste is different for different countries having nuclear power, and depends on the approach selected for reprocessing nuclear fuel. In the USSR, use is made of the process of vitrification for high-level waste, and work is carried out on the use of other matrices (mineral-like and man-made minerals) for inclusion of radioactive waste after extraction of uranium and plutonium out of the products of radioactive treatment. The vitrification technology has been proven in a pilot facility, and starting this year, we plan to use it continuously.

Taking into account that high-level waste management involves dealing with radionuclides having half-lives of more than tens of thousands of years, the Soviet scientists are developing methods of fractionation to separate such radionuclides from the main mass of fission products having half-lives of several tens of years, and their subsequent solidification. It is possible to use many isotopes contained in high-level waste and to develop appropriate storages for each fraction. In this case, the fractions of solidified waste with Sr-90, Cs-137, rare earth elements, and other fission products with half-lives of 30 years or more may be reliably stored. The fraction of long-lived radioactive elements requiring tens and hundreds of thousands of years for their decay may also be stored in depositories where it is possible to retrieve them, if necessary. One important variant of radioactive waste management is its transmutation. On the other hand, the development of fast breeder reactors and using them for burning actinides is surely of interest both from the point of view of waste handling and for a national electricity generation program. Such work is carried out in the Soviet Union.

The issue of decommissioning is closely related to the problem of nuclear waste. The main trend of research is in the development of a technology and a plan for the decommissioning of individual nuclear plants, and the generalization of the obtained technical and economic results. This research should give proven recommendations on how to optimize the components, construction, and subsequent use of buildings and structures in their primary role. Nuclear power plants should be operated to the full extent of the main equipment's design service life, provided appropriate measures are undertaken to enhance safety (with regular monitoring). The reactors or power plants should not be just decommissioned or shut down, but reconstructed in such a way as to permit their further use within the formed infrastructure.

Current nuclear power plants were designed without due concern about their decommissioning. This problem is now being addressed in the USSR. In order to make the problem easier and to reduce the number of units to be decommissioned at the same time, work is being carried out to extend the service life of the main equipment. For example, successful annealing of the pressurized water reactor vessel is done in the USSR.

All of the above leads to a conclusion that expansion of nuclear power in the USSR should be accompanied by the solution of a number of technical problems which are, to a great extent, similar to those in other countries. With this in view, it is exceptionally important to have worldwide cooperation. Joint efforts in working at big projects and solving common problems are already being tried around the world. One of the examples is the IAEA, which is actively promoting research and development efforts in different fields of science and technology, and solving political problems to support peaceful uses of nuclear power.

Some examples of the many programs where Soviet scientists participate are: reactor components and systems, nuclear fuel technology, spent fuel handling, man-machine interaction in nuclear power, probabilistic risk assessment, and public information. Soviet experts, together with the

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experts of Finland and Sweden, monitor the contamination of the Baltic Sea. Other directly related issues are the problems of recovery of territories contaminated as a result of previous activities, or due to accidents such as Chernobyl and Kyshtym. Even a simple exchange of information on the experience in mitigating the consequences of such accidents, in our opinion, is very fruitful. It should be noted that the International Chernobyl Center started to function under the auspices of the IAEA. Examples of international cooperation include:

- Development of joint Soviet-Italian complex dynamic programs for reactor calculations that helped to develop better understanding of the Chernobyl accident and important aspects of nuclear power safety in general.
- Cooperation with Canada on channel-type nuclear reactors.
- Cooperation with Sweden on boiling water reactors.

International cooperation has brought about a unique opportunity to make direct comparison of safety assessments both in the USSR and abroad through the introduction of a powerful computer (Syber) delivered to the USSR as a result of agreement between the Presidents of the USA and the USSR.

Due to the efforts of the Japan Atomic Industrial Forum, we have been fruitfully cooperating, for a number of years now, with the scientific and industrial organizations of Japan in the fields of power reactors, safety of nuclear power plants, bilateral seminars on problems of extending service life, reliability of fuel and structural elements for power generation reactors, and radioactive waste management. We hope to expand and make more profound our bilateral cooperation with Japan, including cooperation on commercial basis. There are good reasons for this, since international specialization and cooperation in industrial spheres are the most effective means of mastering modern technologies and solving tasks that are hard to finance by one state.

For example, this technique is used to finance the European fast breeder reactor and the ITER project. Soviet scientists may well contribute to such cooperation and collaboration, in areas such as reactors of medium power (500 and 600 MW) and district heating nuclear plants. These are but two of the areas that may be of interest to a number of countries.

An important element of our international cooperation is nuclear fuel cycle services. Up until lately, we only were offering our uranium enrichment services and fabricated fuel for nuclear power plants constructed with the help of the USSR. Recently, our country began offering natural and enriched uranium to the world market. Taking into account excess capacities of our factories, and to realize the potential of our industry's advanced processes of uranium extraction and processing, we are interested in substantial participation for a long period in this market.

For the period of 1991-95, we have the capacity to sell to the world market at least 5,000 tons of natural uranium per year. As uranium demand increases, we may increase that amount. Soviet uranium resources, according to geological surveys, are estimated at two million tons, 735 thousand tons of which may be mined at a cost less than US$60/kg of uranium.

Centrifugal separation technology for uranium isotopes allows us to offer our foreign customers enriched UF_6 under both long-term and short-term contracts. Tests have proved that it is possible to use the centrifugal process to enrich regenerated uranium, and produce a product suitable for fuel manufacturing.

At present the Soviet Union is open for commercial cooperation with other countries and international organizations in the field of peaceful uses of nuclear power. We are convinced that only mutually beneficial joint efforts in search of ways to develop international cooperation—such as industrial cooperation and joint ventures, and bilateral commercial and scientific cooperation—will favor further accumulation of knowledge in the field of nuclear physics and its practical application.

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WORLD NUCLEAR PLANT BACKLOG

As of June 1991, 59 commercial nuclear reactors were actively under construction in fifteen different countries, including former COMECON nations. In our last backlog updates of two years ago, COMECON countries were not included, and the total number of units in the backlog totalled 45. Since that time, 13 Western World units have exited the backlog and entered commercial service. NUEXCO considers a unit to enter the backlog when construction starts, and to exit the backlog when commercial operation begins. Consequently, the backlog does not include reactors that have been ordered or are planned, but are not yet under construction. It also excludes reactors that have been indefinitely deferred and all prototype fast breeder reactors. **Figure 1** shows the location of the stations under construction.

Thirteen units entered commercial operation in 1990 and thus far in 1991 (**Table 1**). The number of commercial nuclear power reactors worldwide now totals 418 units at 200 stations, operating in 25 countries, with a total net capacity of 320,363 MWe. The 59 reactors still under construction are listed by country in **Table 2**, and represent an additional 48,724 MWe (net) of future capacity. **Table 3** shows the number of units by completion percentage groups. **Table 4** lists those reactors that are presently indefinitely deferred. NUEXCO expects that most of these latter reactors will never reach commercial operation, but any that do resume construction in the future are not likely to operate until well after the year 2000.

Table 1
UNITS ENTERING COMMERCIAL OPERATION JANUARY 1990 — JUNE 1991

Country	Unit	Commercial Operation Date
Canada	Darlington 2	10/90
France	Penly 1	5/90
France	Golfech 1	6/90
France	Cattenom 3	7/90
India	Narora 1	1/91
Japan	Kashiwazaki-Kariwa 5	4/90
Japan	Kashiwazaki-Kariwa 2	9/90
Japan	Tomari 2	4/91
Mexico	Laguna Verde 1	3/90
Soviet Union	Smolensk 3	9/90
USA	Limerick 2	1/90
USA	Comanche Peak 1	8/90
USA	Seabrook	8/90

ASIA

China

The People's Republic of China has three reactors under construction: two 900-MWe pressurized water reactors (PWR) at Daya Bay in Guangdong Province near Hong Kong, and one 288-MWe (net) PWR at Qinshan. The Qinshan unit is nearly complete and is expected to reach commercial operation in early 1992. Daya Bay 1 is approximately three-fourths complete and scheduled to begin generating power in mid-1992. China National Nuclear Corporation's (CNNC) current goals call for operating nuclear generating capacity to total 6,000 MWe by the year 2000, with an additional 6,000 MWe under construction.

India

Seven of India's reactors are included in the backlog, and represent a total of 1,540 MWe (net) under construction. All the reactors are indigenously-designed pressurized heavy water reactors (PHWR). Narora 2 is complete and should reach commercial operation by the end of 1991. Kakrapar 1, north of Bombay, is expected to go critical in late 1992, followed by Kakrapar 2 a year later. Site work has begun on Rajasthan 3 and 4 in the North, and on Kaiga 1 and 2 near the Arabian Sea. India has plans for 14 more reactors: two more PHWRs at Kaiga, two PWRs at Tarapur, two VVERs (PWR-type) at Kudankalam, and an eight-unit station at Trikkareppur in the state of Kerala on India's southwest coast.

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Figure
WORLD NUCLEAR STATIONS UNDER CONSTRUCTION

Indicates nuclear station with one or more units under construction

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Table 2
WORLD NUCLEAR POWER PLANT BACKLOG

Country	Unit	Type [1]	MWe (net)	Lead Utility or Fuel Buyer [1]	Percent Complete [2]	Estimated COD
Argentina	Atucha 2	PHWR	692	CNEA	68	1994
Brazil	Angra 2	PWR	1,245	Furnas	64	1997
	Angra 3	PWR	1,245	Furnas	39	2001
Bulgaria	Kozloduy 6	VVER	887	Energetika Association	100	1993
Canada	Darlington 1	HWR	881	Ontario Hydro	99	1991
	Darlington 3	HWR	881	Ontario Hydro	84	1992
	Darlington 4	HWR	881	Ontario Hydro	64	1993
China	Daya Bay 1	PWR	900	CNNC	70	1992
	Daya Bay 2	PWR	900	CNNC	60	1993
	Qinshan 1	PWR	288	CNNC	95	1992
Czechoslovakia (CSFR)	Mochovce 1	VVER	388	Ministry Energy & Fuels	100	1993
	Mochovce 2	VVER	388	Ministry Energy & Fuels	na [3]	1994
	Mochovce 3	VVER	388	Ministry Energy & Fuels	na	1996
	Mochovce 4	VVER	388	Ministry Energy & Fuels	na	1997
	Temelin 1	VVER	892	Ministry Energy & Fuels	75	1996
	Temelin 2	VVER	892	Ministry Energy & Fuels	40	1998
France	Cattenom 4	PWR	1,300	EdF	100	1991
	Chooz B1	PWR	1,455	EdF	75	1993
	Chooz B2	PWR	1,455	EdF	51	1994
	Golfech 2	PWR	1,310	EdF	80	1993
	Penly 2	PWR	1,310	EdF	90	1992
India	Kaiga 1	PHWR	220	NPC	18	1995
	Kaiga 2	PHWR	220	NPC	18	1996
	Kakrapar 1 (KAPP)	PHWR	220	NPC	57	1993
	Kakrapar 2 (KAPP)	PHWR	220	NPC	44	1994
	Narora 2 (NAPP)	PHWR	220	NPC	100	1991
	Rajasthan 1	PHWR	220	NPC	10	1995
	Rajasthan 2	PHWR	220	NPC	10	1996
Japan	Genkai 3	PWR	1,121	Kyushu EPC	55	1994
	Genkai 4	PWR	1,121	Kyushu EPC	18	1997
	Hamaoka 4	BWR	1,045	Chubu EPC	55	1993
	Ikata 3	PWR	846	Shikoku EPC	46	1995
	Kashiwazaki-Kariwa 3	BWR	1,045	Tokyo EPC	61	1993
	Kashiwazaki-Kariwa 4	BWR	1,045	Tokyo EPC	41	1994
	Ohi 3	PWR	1,121	Kansai EPC	92	1991
	Ohi 4	PWR	1,121	Kansai EPC	41	1993
	Onagawa 2	BWR	784	Tohoku EPC	13	1995
	Shika 1	BWR	513	Hokuriku EPC	55	1993

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[1] See Abbreviations List at bottom of Table 2.

[2] Status as of 12-31-90.

[3] na: not available

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Table 2
WORLD NUCLEAR POWER PLANT BACKLOG (continued)

Country	Unit	Type [1]	MWe (net)	Lead Utility or Fuel Buyer [1]	Percent Complete [2]	Estimated COD
Mexico	Laguna Verde 2	BWR	654	CFE	62	1994
Romania	Cernavoda 1	HWR	620	Ministry Electrical Energy	63	1995
	Cernavoda 2	HWR	620	Ministry Electrical Energy	45	1996
	Cernavoda 3	HWR	620	Ministry Electrical Energy	23	1998
	Cernavoda 4	HWR	620	Ministry Electrical Energy	12	1999
	Cernavoda 5	HWR	620	Ministry Electrical Energy	8	2001
South Korea	Yonggwang 3	PWR	900	KEPCO	33	1995
	Yonggwang 4	PWR	900	KEPCO	33	1996
Soviet Union	Balakovo 4	VVER	950	MAEI	na [3]	1992
	Balakovo 5	VVER	950	MAEI	na	1995
	Balakovo 6	VVER	950	MAEI	na	1998
	Kalinin 3	VVER	950	MAEI	na	1993
	Kalinin 4	VVER	950	MAEI	na	1995
	Khmel'nitski 2	VVER	950	MAEI	na	1991
	Kostroma 1	VVER	950	MAEI	na	1994
	Kostroma 2	VVER	950	MAEI	na	1995
	Kursk 5	RBMK	925	MAEI	na	1995
	Tatar 1	VVER	950	MAEI	na	1994
United Kingdom	Sizewell B1	PWR	1,100	Nuclear Electric	50	1994
United States	Comanche Peak 2	PWR	1,150	Texas Utilities Electric Co.	86	1992
	Watts Bar 1	PWR	1,177	Tennessee Valley Authority	100	1992
TOTAL			**48,724**			

[1] See Abbreviations List at bottom of Table 2.
[2] Status as of 12-31-90.
[3] na: not available

CAPCO:	Central Area Power Coordinating Group (USA)
CFE:	Comision Federal de Electricidad (Mexico)
CNEA:	Comision Nacional de Energia Atomica (Argentina)
CNNC:	China National Nuclear Corporation (China)
EdF:	Electricité de France (France)
ENUSA:	Empresa Nacional del Uranio SA (Spain)
EPC:	Electric Power Company (Japan)
Furnas:	Furnas Centrais Electricas SA (Brazil)
KEPCO:	Korea Electric Power Company (South Korea)
MAEI:	Ministry of Atomic Energy and Industry (Soviet Union)
NPC:	Nuclear Power Corporation (Department of Atomic Energy—India)
WPPSS:	Washington Public Power Supply System (USA)

BWR:	Boiling Water Reactor
HWR:	Heavy Water Reactor
PHWR:	Pressurized Heavy Water Reactor
PWR:	Pressurized Water Reactor
RBMK:	Reaktory Bolshoi Moshchnosti Kanalnye–graphite moderated water-cooled reactor
VVER:	Vodo-Vodyanoi Energetichesky Reaktor–(PWR type)

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Table 3
COMPLETION PERCENTAGE OF UNITS IN WORLD BACKLOG

Percent Complete	Number of Units
90-100	9
80-89	3
70-79	3
60-69	7
50-59	6
40-49	6
30-39	3
20-29	1
10-19	7
0-9	1
Subtotal	46
Unknown	13
TOTAL	59

Japan

Ten reactors totalling 9,762 MWe of net generating capacity are in various stages of construction in Japan. Kansai Electric Power Company's Ohi 3 unit has begun loading fuel and is expected to reach commercial operation this year. The other nine units are all expected to begin operation before 1997. Japan has not started construction on any new reactors in the past year, but has 13 reactors totalling 13,696 MWe (net) in the advanced planning stage. Recent electricity demand growth estimates forecast a need for approximately 40 new reactors by the year 2010, in addition to Japan's 41 currently operating units.

South Korea

South Korea has two 900-MWe PWRs under construction—Yonggwang 3 and 4. Three more reactors are planned, including a recent order for a second 629-MWe CANDU reactor (Wolsong 2) from Atomic Energy of Canada, Limited. Electricity demand in South Korea is burgeoning, growing at a phenomenal 15 percent per year, leading Korea Electric Power Corporation's president, Ahn Byong-Wha, to recently forecast a need for as many as 18 new reactors by the year 2006.

EUROPE

Bulgaria

Bulgaria currently operates five nuclear plants and has one under construction. Kozloduy 6, an 887-MWe (net) VVER, was 100-percent complete, but is now undergoing retrofitting to meet Western safety standards and should begin commercial operation in 1992–1993. Bulgaria also had two more units under construction at Belene, but these have been indefinitely deferred, due to safety concerns and local opposition.

Czechoslovakia

The Czech and Slovak Federal Republic (CFSR) has six units under construction and plans for as many as twelve more units. Four 388-MWe (net) second-generation VVERs are being constructed at the Mochovce site, and are expected to enter commercial operation in the mid-1990s. Two 892-MWe VVERs under construction at Temelin are scheduled for completion in 1994 and 1996, although they may be delayed for modification of the instrumentation and control (I & C) systems. The Czechoslovakian utility, Ceske Energeticke Zavody (CEZ), is still evaluating bids from Western firms to retrofit the I & C system at Temelin. CEZ is also evaluating five voluminous bids from Western firms to build a new Western-design, two-unit nuclear station. A short list of bidders is scheduled to be announced by late 1991. However, due to capital constraints and safety concerns, the current government is reassessing all reactor plans.

France

Three French reactors began pre-commercial operation in 1990: Penly 1, Golfech 1, and Cattenom 3, leaving five reactors on the backlog list. Cattenom 4 is scheduled to be connected to the grid by this fall, and Penly 2 is scheduled for 1992. The other three units are planned to begin operation in 1993-1994. In 1990, Electricité de France, the national utility, placed the only order for a new reactor in Western Europe; construction has not yet begun on the 1,400 MWe Civaux 1 PWR.

Romania

Construction remains suspended on Romania's five 620-MWe (net) heavy water reactors (HWR). Despite the government's high priority on completing the

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units, construction has been frozen since 1989 pending verification and documentation of the work already completed. The suspension has allowed time for repairs and retrofits to bring the units up to Western standards. Numerous other challenges facing the Romanian government make it likely that the first of these units will not be commissioned at least until the second half of this decade.

Soviet Union

Two reactors recently entered commercial operation in the Soviet Union: Zaporozhe 5, a 950-MWe VVER in the Ukraine, began operating in late 1989, and Smolensk 3, a 925-MWe RBMK (a graphite-moderated, water-cooled reactor) near the border of Belorussia and Russia, began operating in September 1990. Due to severe local opposition, safety concerns, and economic constraints, only ten reactors remain actively under construction in the Soviet Union. In the past few years, nearly 100,000 MWe of nuclear capacity has been cut from original plans. However, the Soviet Union still has the third-largest nuclear program in the world, after the USA and France. The ten units still under construction total 9,475 MWe (net) and all are expected to be completed before the end of the decade.

United Kingdom

The only nuclear unit under construction in the UK is the 1,100-MWe Sizewell B PWR. The half-completed reactor was eight months ahead of schedule as of the end of 1990.

NORTH AMERICA

Canada

Three units at Ontario Hydro's Darlington station remain under construction. Unit 2 began commercial operation in October 1990, with Unit 1 scheduled to start up later this year. Darlington 3 and 4 should be completed by 1993, bringing the station's capacity up to 3,524 MWe. Other plans for new units in Ontario are uncertain, as the recently-elected New Democratic Party has an anti-nuclear platform and has declared that any other nuclear plant planning or construction shall be halted for at least three years, and likely will be terminated altogether. Ontario Hydro's 25-year demand/supply plan that was released in 1990 had called for ten additional reactors by 2014.

Mexico

Mexico had its first commercial nuclear plant, Laguna Verde 1, reach full power on March 17, 1990. A replicate unit to this plant is now under construction. Unit 2 is more than 60 percent complete, and is scheduled for commercial operation in 1994.

USA

Three reactors overcame a long series of obstacles and challenges and entered commercial service in 1990: Limerick 2, Comanche Peak 1, and Seabrook. Thus, the US backlog of nuclear plants actively under construction has declined to only two units: Tennessee Valley Authority's Watts Bar 1, and Texas Utilities' Comanche Peak 2. Both plants are projected to reach commercial operation by the end of 1992. This leaves seven units, in various stages of completion, categorized as indefinitely deferred (**Table 4**), including the fully-completed Shoreham unit.

SOUTH AMERICA

Argentina

Argentina has only one reactor still under construction; Atucha 2, a 692-MWe PWR, is about 68-percent complete. Design changes and financial problems have pushed back its completion date until 1994, although a recently concluded agreement with Germany for a matching-fund loan makes the future of this reactor much more secure.

Brazil

Angra 2 and 3, both 1,245-MWe PWRs, are the only two reactors under construction in Brazil. Angra 2 is about 64-percent complete and Angra 3, about 39-percent complete; however, due to capital constraints, the completion of Angra 3 is uncertain. If completed, Brazil's total nuclear generating capacity will reach 3,116 MWe (net).

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Table 4
WORLD NUCLEAR UNITS UNDER CONSTRUCTION BUT INDEFINITELY DEFERRED

Country	Unit	Type [1]	MWe (net)	Lead Utility or Fuel Buyer [1]	Percent Complete [2]
Bulgaria	Belene	VVER	887	Energetika Association	na [3]
	Belene	VVER	887	Energetika Association	na
Canada	Point Lepreau 2	HWR	900	New Brunswick EPC	0
Germany	Greifswald 5	VVER	408	Treuhandanstaldt	100
	Greifswald 6	VVER	408	Treuhandanstaldt	90
	Greifswald 7	VVER	408	Treuhandanstaldt	60
	Greifswald 8	VVER	408	Treuhandanstaldt	50
	Stendal 1	VVER	900	Treuhandanstaldt	na
	Stendal 2	VVER	900	Treuhandanstaldt	na
Philippines	PNPP 1	PWR	620	National Power Corp.	98
Poland	Zarnowiec 1	PWR	424	Atomic Energy Agency	30
Soviet Union	Bashkir 1	VVER	950	MAEI	na
	Bashkir 2	VVER	950	MAEI	na
	Khmel'nitsky 3	VVER	950	MAEI	na
	Khmel'nitsky 4	VVER	950	MAEI	na
	Rostov 1	VVER	950	MAEI	na
	Rostov 2	VVER	950	MAEI	na
	Rostov 3	VVER	950	MAEI	na
	Rostov 4	VVER	950	MAEI	na
	Rovno 4	VVER	950	MAEI	na
	Rovno 5	VVER	950	MAEI	na
	Rovno 6	VVER	950	MAEI	na
	South Ukraine 4	VVER	950	MAEI	na
	Zaporozhe 6	VVER	950	MAEI	na
Spain	Valdecaballeros 1	BWR	930	ENUSA	71
	Valdecaballeros 2	BWR	975	ENUSA	58
	Lemoniz 1	PWR	900	Iberduero	97
	Lemoniz 2	PWR	900	Iberduero	57
United States	Bellefonte 1	PWR	1,213	Tennessee Valley Authority	89
	Bellefonte 2	PWR	1,213	Tennessee Valley Authority	58
	Perry 2	BWR	1,205	CAPCO	57
	Shoreham	BWR	809	Long Island Lighting Co.	100
	Watts Bar 2	PWR	1,177	Tennessee Valley Authority	85
	WNP 1	PWR	1,250	WPPSS	65
	WNP 3	PWR	1,240	WPPSS	75

[1] See Abbreviations List at bottom of Table 2.

[2] Status as of 12-31-90.

[3] na: not available

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NUCLEAR INDUSTRY CALENDAR

1991

Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES, 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U.S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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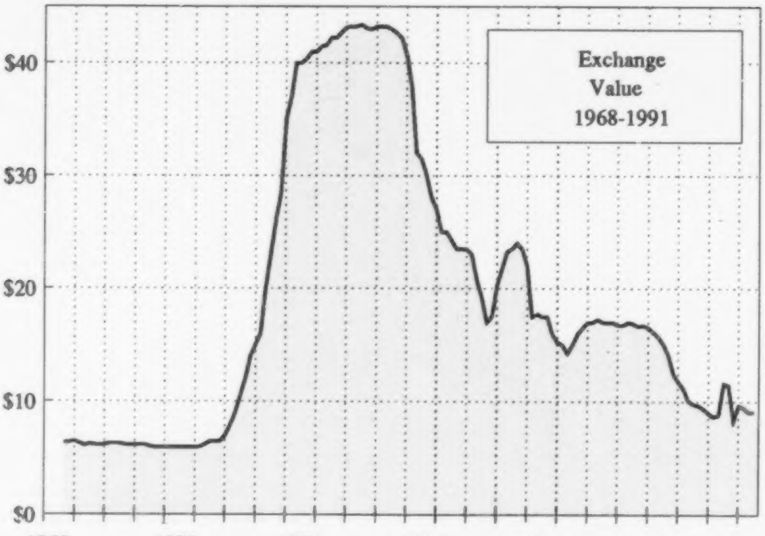
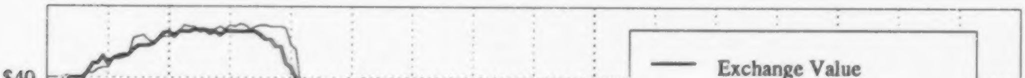
NUEXCO Historical Exchange Value and Transaction Value

(in US dollars per Pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	**9.05**						

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF_6 Values

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	**27.25**						

US Premium (Relative to the UF_6 Value)

Determined as of the last day of the month indicated ($US/kg U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF_6)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	**1.50**						

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	**9.20**						

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	**59**						

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	**3.50**						

* Float with Prime Rate

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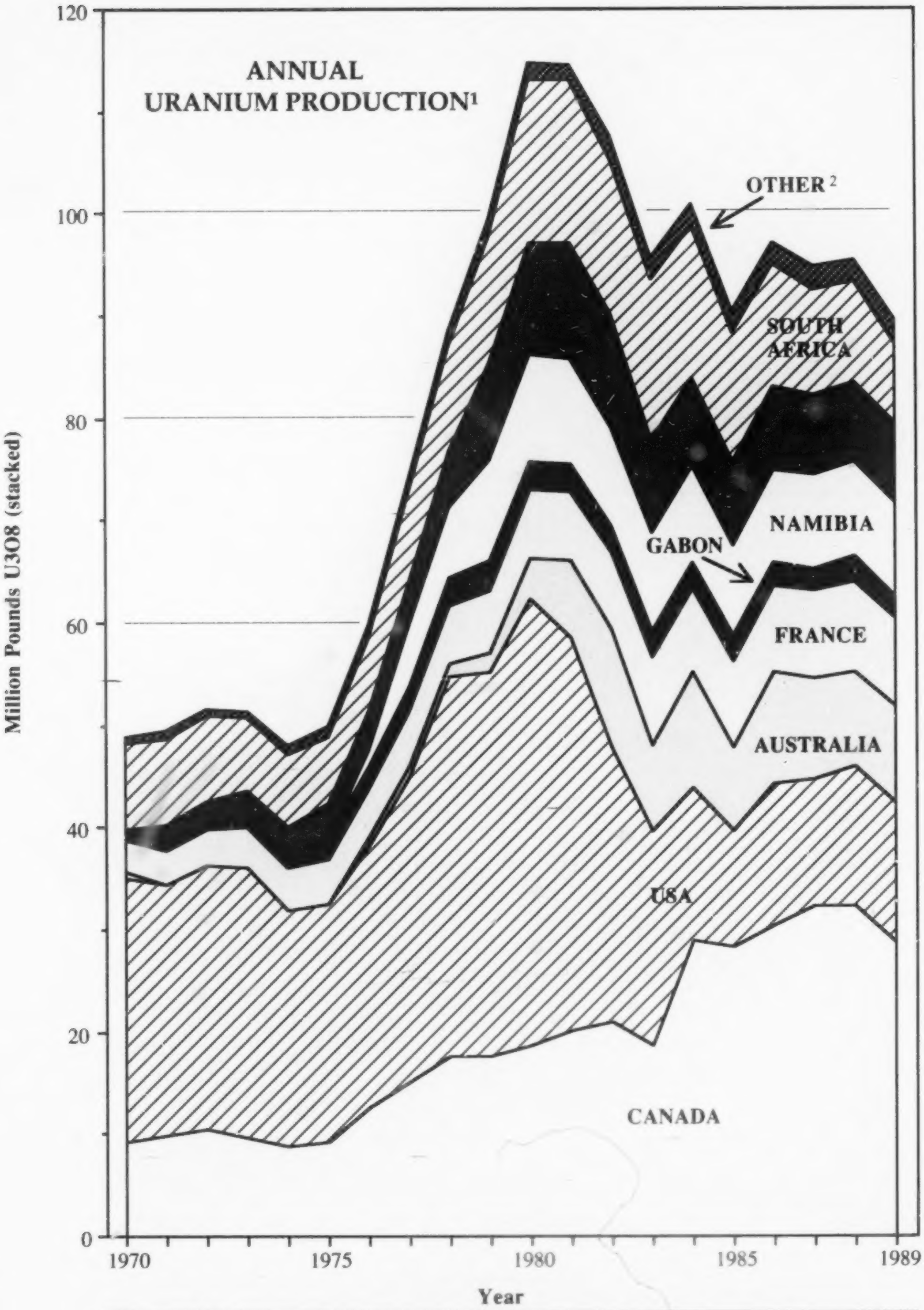

[1] Estimated world production in 1989 totalled 89.6 million pounds (Australia—9.5; Canada—28.7; France—8.5; Gabon—2.2; Namibia—9.2; Niger—7.7; South Africa—7.7; USA—13.7; Others[2]—2.3).

[2] **Other** includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, (West) Germany, and Yugoslavia

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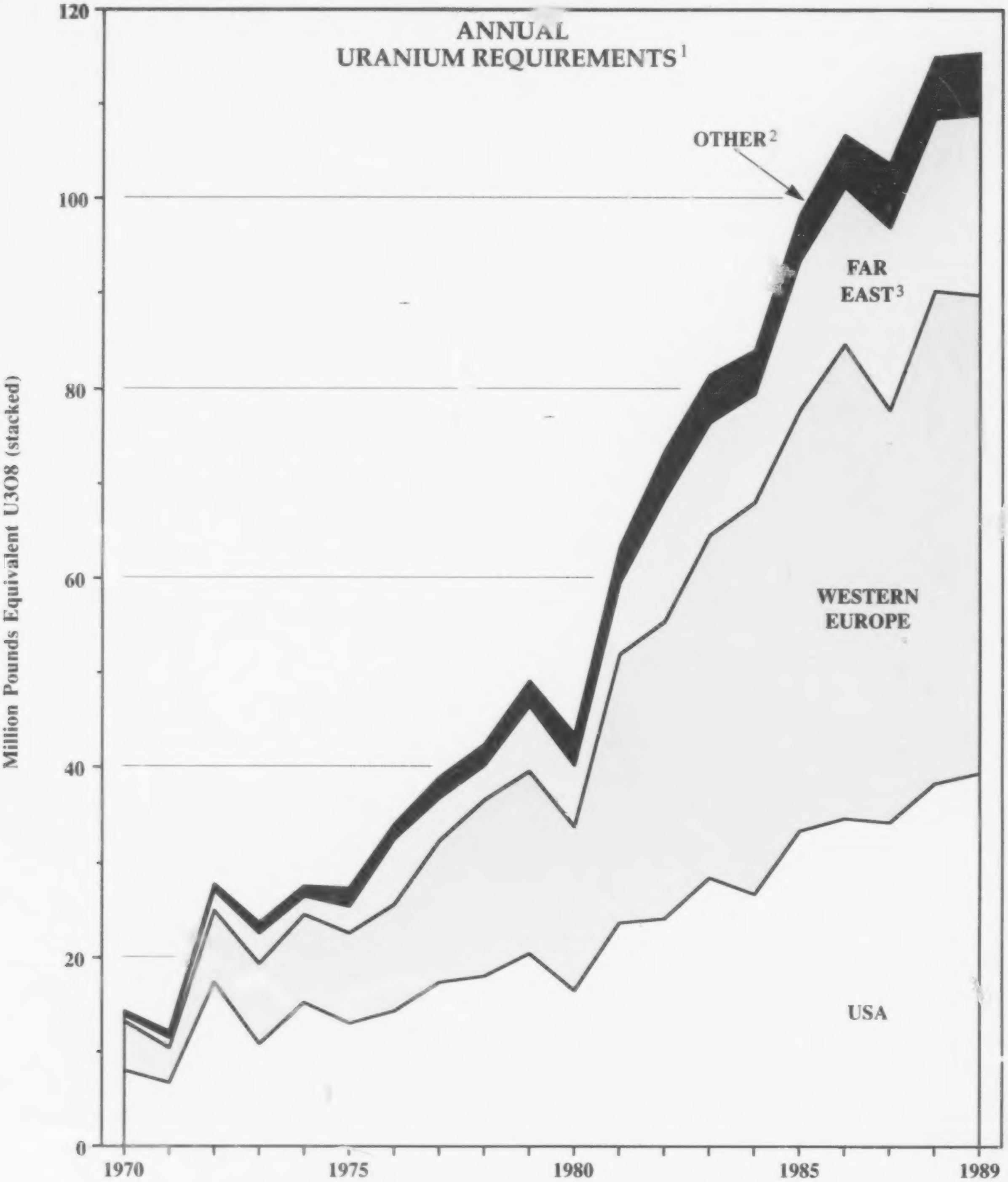

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8 R
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.1
Sept	1990	208.9	128.2	—	130.3 R
Oct	1990	—	134.1	—	130.4 [illegible]
Nov	1990	—	133.7	589.20	130.4
Dec	1990	214.5	128.8	—	130.6 R
Jan	1991	[illegible]	1[illegible]	—	130.6 R
Feb	1991	—	121.5	—	130.5 R
Mar	1991	214.1	119.1	—	130.6 R
Apr	1991	—	—	—	130.7

P = Preliminary **R** = Revised since last month

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[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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GOVERNMENT STATISTICS

Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	--.--	--.--	--.--	--.--	--.--
1981	Avg.	83.4	75.5	--.--	--.--	--.--	--.--	--.--
1982	Avg.	89.0	83.7	--.--	--.--	--.--	--.--	--.--
1983	Avg.	92.1	88.5	17.22	--.--	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	--.--	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.8	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	110.9	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1 **R**	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.5 **R**	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8 **R**	125.5	24.19 **R**	22.22 **R**	20.27 **R**	15.21 **R**	16.47 **R**
Apr	1991	109.2 **R**	125.5	24.79 **P**	22.52 **P**	20.29 **P**	14.59 **P**	16.39 **P**
May	1991	108.9	126.1	--.--	--.--	--.--	--.--	--.--

P = Preliminary **R = Revised since last month**

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	660,151	942,331
Jan	1991	—	—	219.5	218.0	648,944	935,839
Feb	1991	—	—	222.2	219.3	650,948	893,373
Mar	1991	137.66	323.82	224.1	218.5	—	—
Apr	1991	—	—	227.3	220.9	—	—
May	1991	—	—	230.8	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average, Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]				Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	**All Commodities (1982 = 100)**	**Consumer Price Index[2] (1982-1984 = 100)**	**GNP Implicit Price Deflator[3] (1982 = 100)**	**Metal Mining (SIC 10)**	**Primary Non-ferrous Metals (SIC 333)**	**Chemicals and Allied Products (SIC 28)**	**Electric and Electronic Equipment (SIC 36)**
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3 **R**	119.0 **R**	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8 **R**	14.93 **R**	14.55 **R**	13.85 **R**	10.55 **R**
Apr	1991	115.5	116.0	135.2	—	14.91 **P**	14.62 **P**	13.97	10.63 **R**
May	1991	116.1	116.5	135.6	—	–·–	–·–	14.03 **P**	10.68 **P**

P = Preliminary   **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC [2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts [3] Average Price		Spot Contracts [3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] ($/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity.*
1984-1989: Energy Information Administration, *Uranium Industry Annual.*

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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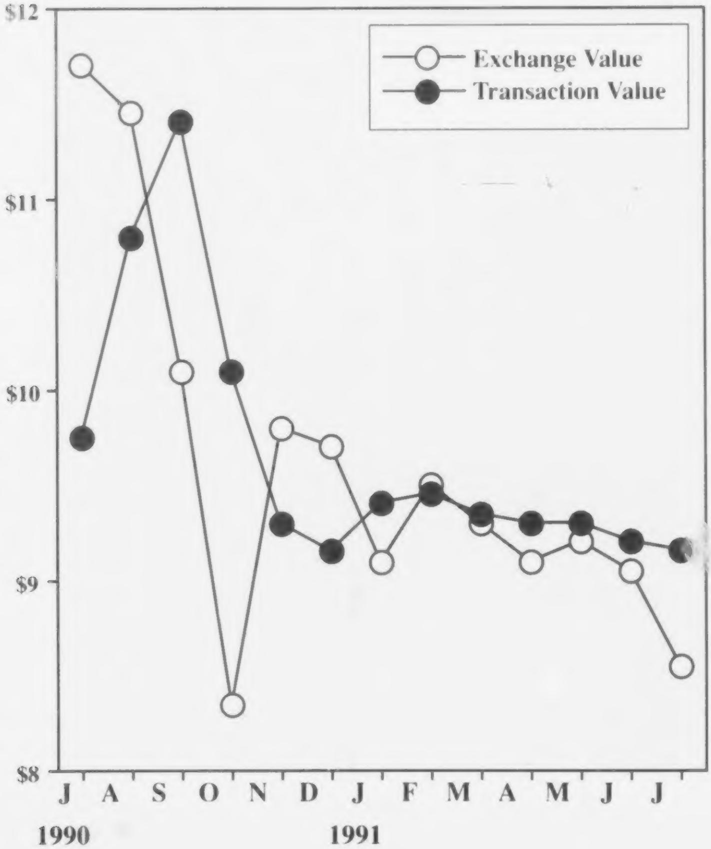

NUEXCO

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To Our Readers

NUEXCO is pleased to announce it has nominated Dr. R. Gene Clark as Executive Vice President of Global Nuclear Services and Supply, Ltd. (GNSS). GNSS is the company jointly formed by NUEXCO and Techsnabexport (TENEX) to market Soviet nuclear fuel products and services to utilities, principally in the United States and the Far East, although generally operating worldwide. Gene has been a Commercial Representative for NUEXCO in Hong Kong for the past two years, and prior to that assignment was President of NUEXCO Information Systems in Denver. Gene and his wife will be relocating to Washington D.C. by mid-September.

TENEX has announced that it has nominated Mr. Alexander (Sasha) Chernov as President of GNSS, and that it also has assigned Mr. Paul Kroupnik to the GNSS venture. Mr. Chernov is currently Deputy General Director of TENEX and Mr. Kroupnik is presently Deputy Director of Uranservis. Mr. Chernov and Mr. Kroupnik and their families are expected to relocate to Washington D.C. by the end of October.

In addition, Mr. Ron Witzel, of NUEXCO's San Francisco office, will be devoting a significant portion of his time working with GNSS. Ron will continue to be involved with other nuclear fuel business activities for NUEXCO, and thus, will be splitting his time between the San Francisco office and the GNSS office in Washington D.C.

We congratulate Gene, Sasha, Paul, and Ron on their new responsibilities.

* * *

Readers will also note that a subject index of material from the NUEXCO Monthly Reports of January 1990 through June 1991 is included as an insert in this month's Report. A more comprehensive index covering topics back through 1978 will be released early in 1992.

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IN MEMORIAM

It is with deep sorrow that we must announce the death of T. J. (Tom) Barendregt, a member of CONCORD's International Advisory Committee (IAC). Tom died on Monday, July 15 of a heart attack.

Tom was the IAC's representative from The Netherlands. He was a well-known consultant on business affairs of Europe and South America, and an expert in the nuclear industry. His experience included consulting work for NUCLEBRAS of Brazil, and president of NUCON B.V., a nuclear engineering contractor from The Netherlands. Tom was formerly an executive director of EUROCHEMIC, a reprocessing company in Mol, Belgium, and he had also been a managing director for Comprimo, a petroleum and nuclear engineering firm.

Tom was 71. We join his wife Claire, his two sons, Herman and Peter, his three grandchildren, and his many friends and colleagues in mourning his death.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report July 31, 1991	Last Report June 30, 1991	12 Months Ago July 31, 1990
EXCHANGE VALUE[1]	**$8.55**/lb equivalent U_3O_8	$9.05	$11.70
UF_6 VALUE[2]	**$25.75** /kg U as UF_6	$27.25	$32.50
LOAN RATE[3]	**3.5%** /annum	3.5%	3.5%
CONVERSION VALUE[4]	**$1.50**/lb U as UF_6	$1.50	$1.45
SWU VALUE[5] **(0.3 $^w/_o$ tails assay)**	**$66**/SWU	$59	$50
TRANSACTION VALUE[6]	**$9.15**/lb equivalent U_3O_8	$9.20	$9.75
Transactions	**21**	24	35
Months	**3**	3	3
Millions of Pounds	**4.1**	6.3	9.1

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Value** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

- **a)** Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
- **b)** At least ten transactions;
- **c)** Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.

- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.

- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.

- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.

- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.

- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.

- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.

- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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JULY MARKET REVIEW

(as of July 31, 1991)

OVERVIEW

Uranium prices continued to decline during July, while enrichment prices continued their dramatic upturn. The July 31 Exchange Value fell to $8.55 per pound U_3O_8—a $0.50 decrease. Similarly, the UF_6 Value also dropped, decreasing $1.50, to $25.75 per kgU as UF_6. Abundant supply and lack of near-term demand led to the price declines. Six near-term uranium sales totalling only 1.4 million pounds equivalent U_3O_8 were reported in July (**Table 1**). This is considerably below 1991's monthly average through July of nine sales and 2.1 million pounds. Of July's six sales, four involved concentrates, one involved natural UF_6, and one involved enriched uranium product (EUP).

The Loan Rate and Conversion Value both remained unchanged at 3.5 percent per annum and $1.50 per pound U as UF_6, respectively. Two loans totalling over four million pounds equivalent U_3O_8 were reported. No conversion sales were reported.

The enrichment market remained the center of attention as increasing demand and limited supply led to a record $7 increase in the SWU Value, to $66 per SWU. Three near-term enrichment sales totalling nearly 100 thousand SWU, and four long-term SWU sales totalling over 1.5 million SWU were reported.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	July 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	4	0.9	41	8.8
Natural UF_6	1	0.3	14	4.6
EUP	1	0.2	8	1.5
Total[2]	**6**	**1.4**	**63**	**14.9**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

URANIUM AND CONVERSION

Uranium prices broke sharply lower during July: the **Exchange Value** fell $0.50 (5.5%), to **$8.55** per pound U_3O_8. With the exception of the record low of $8.35 last October 31, the current Exchange Value is at its lowest level since the early 1970s. A number of aggressive sellers combined with limited demand forced prices lower. Last fall, the record low prices led many discretionary buyers to enter the market and most sellers to exit the market. Through July of this year however, the falling prices had not yet generated that market response. But by early August, it was clear that a threshold had been reached and numerous discretionary buyers entered the market.

Four spot concentrates sales were reported in July totalling 900 thousand pounds equivalent U_3O_8. Utilities made all four purchases from intermediaries and producers, and all called for delivery before the end of this year.

* * *

Following the concentrates market, the **UF_6 Value** also fell 5.5 percent, declining $1.50, to **$25.75** per kgU as UF_6. Low-priced concentrates combined with market-price conversion yielded lower UF_6 prices, and contributed to the downward pressure on the UF_6 market. In addition, newly aggressive UF_6 sellers have emerged in the past few weeks.

Only one natural UF_6 transaction was reported in July. A US utility purchased approximately 300 thousand pounds equivalent U_3O_8 after evaluating several competitive offers. One other near-term transaction was reported in which a US utility purchased over 200 thousand pounds equivalent U_3O_8 contained in EUP from an intermediary.

* * *

In the long-term uranium market, three sales were reported in July, but all had occurred earlier in the year. A total of 2.7 million pounds equivalent U_3O_8 will be delivered during the period 1995 through 2001, with almost one million pounds of the total contained in EUP.

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The **Transaction Value** dipped $0.05, to **$9.15** per pound U_3O_8 based on 21 transactions over 3 months involving 4.1 million pounds equivalent U_3O_8. Although prices were down sharply, the relatively low volume of July sales served to limit the decrease in the Transaction Value.

* * *

Active uranium supply dropped to **6.0** million pounds equivalent U_3O_8, but remains significantly larger than **active uranium demand**, which declined to only **850** thousand pounds equivalent U_3O_8. The **supply/demand ratio** increased to **7.1**.

* * *

The **Loan Rate** remained unchanged at **3.5** percent per annum. Two loans totalling nearly four million pounds equivalent U_3O_8 were reported. A utility and a producer borrowed the material at levels near the July 31 Loan Rate. Loan supply increased to 5.5 million pounds equivalent U_3O_8 (**Table 2**), while loan demand remained at zero.

* * *

The **Conversion Value** remained **$1.50** per pound U as UF_6 for the third consecutive month. No near-term transactions were reported, although two utilities are in final negotiations with their selected long-term suppliers.

* * *

ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

In an active market, the **SWU Value** rose seven dollars (11.9%), to **$66** per SWU. This is the largest change, both in absolute and percentage terms, in the history of the NUEXCO SWU Value (first published on January 31, 1986). Increasing demand and limited supply led to the record increase. On the supply side of the market, some enriched inventories that have been overhanging the market for the last couple of years have apparently been withdrawn or sold. The current price rise has increased utility interest in the enrichment market, and may lead to some acceleration of purchasing activity.

Three near-term enrichment sales were reported, in which US utilities purchased almost 100 thousand SWU. One of the sales involved SWU contained in EUP. In addition, two utilities were evaluating near-term offers at month end, and several more buyers were expected to request near-term offers over the next month.

The long-term SWU market showed an increased level of activity as well. Four long-term sales were reported, totalling over 1.4 million SWU for delivery during the period 1992 through 2001. One of the sales involved SWU contained within EUP and was concluded earlier this year, while another sale occurred in July but was inadvertently left out of the totals reported in NUEXCO's July 31 Market Activity Summary. The high level of activity in the market is expected to continue as at least 12 utilities were evaluating long-term offers at the end of July.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	6,030	850
• Supply/Demand Ratio:	7.1	
• Loan (thousand lbs equivalent U_3O_8)	5,470	0
• Conversion (thousand lbs U as UF_6)	700	1,020
• SWU (thousand SWUs)	400	470

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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Euratom Supply Agency Annual Report 1990

In other market news, the Euratom Supply Agency recently released its 1990 Annual Report summarizing the status of the nuclear fuel cycle industry within the European Community (EC). Nuclear power provides approximately 35 percent of the EC's annual electricity production, with half of the EC's twelve Member States using some nuclear-generated electricity.

Euratom reports that most of the natural uranium contracts signed during 1990 concerned spot-market transactions, although some long-term contracts were concluded. These long-term contracts typically provided buyers with favorable pricing terms and excellent flexibility on delivery quantities. For spot-market contracts, prices were frequently low, although volatile, ranging from US$8.55 to $13.35 per pound U_3O_8 during the year. For the year, 1990 deliveries of natural uranium to EC entities totalled more than 33 million pounds equivalent U_3O_8, of which nearly 17 percent was delivered under spot or near-term contracts. The average price of uranium delivered under medium- and long-term contracts during 1990 dropped to $29.39 per pound U_3O_8, while the average price for spot contract deliveries was $9.68 per pound. Comparable historical average price figures are given in the back of this Report in the table entitled *Volume and Price of Uranium Deliveries to the European Community*.

In the enrichment market, most EC transactions were spot purchases concluded near $50 per SWU. The Euratom Report also states that "although the potential availability of substantial quantities of low priced separative work from the USSR continued to be widely publicized, purchases from this source during 1990 by Community entities were negligible." In all, deliveries to EC utilities totalled approximately 1,700 tonnes of low-enriched uranium. About 85 percent of this material was enriched by Eurodif or Urenco, with the balance supplied by the US DOE or TENEX.

Table 3
ENRICHMENT PRICES
(July 31, 1991)

Prices	This Month Report 276	Last Month Report 275	12 Months Ago Report 264
NUEXCO SWU Value ($US per SWU)	66	59	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[2]	153.00[2]	153.00[2]
Requirements	157.00[2]	157.00[2]	157.00[2]
Incentive Price (IP2)[3]	100.68[3]	100.68[3]	90.00[4]
Calculated worth of enriched UF_6[5]: ($US per KgU as UF_6)			
2.0 w/o U^{235}	218	212	225
2.5 w/o U^{235}	305	294	308
3.0 w/o U^{235}	395	379	393
3.5 w/o U^{235}	486	466	480
4.0 w/o U^{235}	579	554	568
4.5 w/o U^{235}	673	643	657

[1] Effective 10/1/89 to 9/30/91.

[2] Effective since 10/1/84.

[3] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.

[4] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.

[5] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5157	1991	101-300	**R**	Utility	Producer	
5158	1991	301-600	103-110	Utility	Intermediary	
5161A	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5162	1991	101-300	103-110	Utility	Intermediary	
5166	1991	50-100	98-102	Utility	Intermediary	
5167	1991	301-600	98-102	Utility	Intermediary	UF_6
5168A	1996-2001	601-1,000	See Remarks	**R**	Intermediary	Contained in EUP; Occurred earlier in 1991
5169	1995-2000	601-1,000	See Remarks	**R**	Producer	Occurred earlier in 1991
5170	1995-2000	601-1,000	See Remarks	**R**	Producer	Occurred earlier in 1991

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Loan Rate	Borrower	Lender	Remarks
5174	1991	601-1,000	98-102	Producer	Utility	UF_6
5176	1991	1,001-3,000	98-102	Utility	Utility	

Conversion Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range[2] of Current Conversion Value	Buyer	Seller	Remarks

No Conversion Sales are reported

Enrichment Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity[3] (thousand SWU)	Price Within Percentage Range[2] of Current SWU Value[4]	Buyer	Seller	Remarks
5153	1996-1998	301-600	**R**	Utility	**R**	
5160	1996-1998	101-300	**R**	Utility	**R**	
5161B	1992	Less than 50	See Remarks	Utility	Intermediary	Contained in EUP
5168B	1996-2001	601-1,000	See Remarks	**R**	Intermediary	Contained in EUP; Occurred earlier in 1991
5171	1991	Less than 50	90-97	Utility	Intermediary	
5173	1992	Less than 50	98-102	Utility	Intermediary	
5179	1992-1994	100-300	**R**	Utility	Intermediary	

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[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE FOR SALE:				
ACTIVE				
89-1054A*	500	—	1991 on	UF_6e
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
91-1060	100	—	1991	
91-1157	100	—	1991	
91-1502	500	—	1991	
91-1503A	1,330	2,670	1991-1993	UF_6e
91-1505*	1,500	—	1991	
91-1506*	500	—	1991	
91-1507*	500	—	1991	
TOTAL	**6,030**			
INACTIVE	**5,530**			
AVAILABLE TO LOAN:				
ACTIVE				
91-1084	3,900	—	—	U_3O_8
91-1132	100	—	—	U_3O_8
91-1146	140	—	—	UF_6
91-1151	390	—	—	U_3O_8
91-1175*	340	—	—	U_3O_8
91-1181*	600	—	—	U_3O_8
TOTAL	**5,470**			
INACTIVE	**655**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 90-1078A, 90-1501, 91-1145, 91-1508

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1010A	85	—	1991	UF_{6e}
91-1165*	325	—	1991	
91-1182*	75	—	1991-1992	
91-1183*	25	—	1991	
91-1186*	340	—	1991	
90-1291	—	100 per year	1991-1995	
91-1064	—	460 per year	1993-1997	U_3O_8/UF_6
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184*	—	350 per year	1993-1997	
91-1141	—	500	1994	
TOTAL	**850**			
INACTIVE	**1,405**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

---

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 90-1304, 91-1112, 91-1158
Active Projects removed since last month: 90-1224A, 91-1014A, 91-1017, 91-1094A, 91-1102, 91-1106, 91-1108, 91-1110, 91-1127A, 91-1138

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years[1]	Quantity (Thousand Pounds U as UF6) Beyond 3 Years[1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1500	300	—	1991	
91-1501	400	—	1991	
TOTAL	**700**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1174*	660	—	1991-1992	
91-1185*	360	—	1991	
91-1170*	—	1,100	1992-1996	
TOTAL	**1,020**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1103

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
89-1054B*	100	—	1991 on	UF$_6$e
91-1508*	100	—	1991	
91-1509*	200	—	1992	
90-1500	—	1,000 per year	1991 on	
TOTAL	**400**			
INACTIVE	**1,235**			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1010B	20	—	1991	UF$_6$e
91-1150	150	—	1991	
91-1156*	300	—	1992	
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	UF$_6$e
91-1027	—	55 per year	1996-2000	
91-1063	—	15 per year	1995-1998	
91-1094B	—	385 per year	1994-1995	UF$_6$e
91-1105*	—	40 per year	1996-2001	
91-1142	—	75 per year	1995-2000	
91-1131	—	3,660	1995-2001	
91-1136	—	120	1996-2000	
90-1144	—	240	1995-2000	
90-1224B*	—	1,670	1995-2001	UF$_6$e
91-1014B	—	1,770	1992-2001	UF$_6$e
91-1066	—	320	1995-2000	
91-1152	—	2,700	1995-2001	
91-1154	—	285	1996-2001	
91-1155*	—	450	1996-1999	
91-1160*	—	980	1992-1997	
91-1171*	—	560	1995-1998	
91-1179*	—	245	1992-1994	
TOTAL	**470**			
INACTIVE	**245**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1128

Active Projects removed since last month: 90-1078B, 90-1181, 91-1008, 91-1032, 91-1083, 91-1109, 91-1113, 91-1120, 91-1121, 91-1127B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (July 31, 1991)	Last Month (June 30, 1991)	12 Months Ago (July 31, 1990)	This Month (July 31, 1991)	Last Month (June 30, 1991)	12 Months Ago (July 31, 1990)
Australia (dollar)	10.98	11.81	14.78	28.53	30.70	38.42
Belgium (franc)	307.00	337.31	386.27	798.14	876.93	1,004
Canada (dollar)	9.84	10.33	13.48	25.58	26.87	35.06
EC (ecu)	7.28	7.98	9.11	18.92	20.75	23.68
Finland (markka)	35.89	38.81	44.06	93.30	100.90	114.54
France (franc)	50.68	55.55	62.83	131.75	144.41	163.34
Germany (mark)	14.90	16.39	19.46	38.75	42.62	50.59
Italy (lira)	11,124	12,182	13,747	28,920	31,670	35,739
Japan (yen)	1,175	1,246	1,732	3,054	3,239	4,502
Netherlands (guilder)	16.80	18.47	21.18	43.69	48.02	55.05
So. Africa (comm. rand)	24.49	26.13	30.41	63.67	67.92	79.07
So. Korea (won)	6,255	6,555	8,371	16,263	17,042	21,764
Spain (peseta)	933.20	1,028	1,154	2,426	2,672	3,001
Sweden (krona)	54.08	59.19	68.50	140.60	153.88	178.09
Switzerland (franc)	13.02	14.06	15.91	33.85	36.55	41.35
Taiwan (dollar)	227.51	242.81	313.56	591.49	631.25	815.20
UK (pound)	5.07	5.57	6.33	13.18	14.49	16.46
US (dollar)	8.55	9.05	11.70	22.23	23.53	30.43

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (July 31, 1991)	Last Month (June 30, 1991)	12 Months Ago (July 31, 1990)	This Month (July 31, 1991)	Last Month (June 30, 1991)	12 Months Ago (July 31, 1990)
Australia (dollar)	11.75	12.00	12.32	30.54	31.20	32.02
Belgium (franc)	328.55	342.90	321.89	854.15	891.46	836.84
Canada (dollar)	10.53	10.51	11.24	27.38	27.31	29.21
EC (ecu)	7.79	8.12	7.59	20.24	21.10	19.73
Finland (markka)	38.41	39.45	36.71	99.85	102.57	95.45
France (franc)	54.23	56.47	52.36	140.99	146.80	136.12
Germany (mark)	15.95	16.67	16.21	41.46	43.33	42.16
Italy (lira)	11,905	12,384	11,456	30,950	32,195	29,782
Japan (yen)	1,257	1,266	1,443	3,268	3,292	3,751
Netherlands (guilder)	17.98	18.78	17.65	46.75	48.81	45.88
So. Africa (comm. rand)	26.21	26.56	25.34	68.14	69.05	65.89
So. Korea (won)	6,694	6,664	6,976	17,404	17,324	18,137
Spain (peseta)	998.69	1,045	961.82	2,596	2,716	2,501
Sweden (krona)	57.87	60.17	57.08	150.46	156.43	148.41
Switzerland (franc)	13.94	14.29	13.25	36.23	37.16	36.46
Taiwan (dollar)	243.48	246.83	261.30	633.00	641.71	679.33
UK (pound)	5.43	5.67	5.28	14.10	14.73	13.72
US (dollar)	9.15	9.20	9.75	23.79	23.92	25.35

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF6 This Month (July 31, 1991)	per lb U as UF6 Last Month (June 30, 1991)	per lb U as UF6 12 Months Ago (July 31, 1990)	per kg U as UF6 This Month (July 31, 1991)	per kg U as UF6 Last Month (June 30, 1991)	per kg U as UF6 12 Months Ago (July 31, 1990)
Australia (dollar)	1.93	1.96	1.83	4.25	4.31	4.04
Belgium (franc)	53.86	55.91	47.87	118.74	123.26	105.54
Canada (dollar)	1.73	1.71	1.67	3.81	3.78	3.68
EC (ecu)	1.28	1.32	1.13	2.81	2.92	2.49
Finland (markka)	6.30	6.43	5.46	13.88	14.18	12.04
France (franc)	8.89	9.21	7.79	19.60	20.30	17.17
Germany (mark)	2.61	2.72	2.41	5.76	5.99	5.32
Italy (lira)	1,952	2,019	1,704	4,303	4,451	3,756
Japan (yen)	206.07	206.47	214.59	454.31	455.19	473.09
Netherlands (guilder)	2.95	3.06	2.62	6.50	6.75	5.79
So. Africa (comm. rand)	4.30	4.33	3.77	9.47	9.55	8.31
So. Korea (won)	1,097	1,086	1,037	2,419	2,395	2,287
Spain (peseta)	163.72	170.32	143.04	360.94	375.49	315.35
Sweden (krona)	9.49	9.81	8.49	20.92	21.63	18.72
Switzerland (franc)	2.28	2.33	1.97	5.04	5.14	4.35
Taiwan (dollar)	39.91	40.24	38.86	88.00	88.72	85.67
UK (pound)	0.89	0.92	0.78	1.96	2.04	1.73
US (dollar)	1.50	1.50	1.45	3.31	3.31	3.20

SWU Value And UF6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (July 31, 1991)	SWU Value at 0.30 w/o Tails Assay Last Month (June 30, 1991)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (July 31, 1990)	UF6 Value per kg U as UF6 This Month (July 31, 1991)	UF6 Value per kg U as UF6 Last Month (June 30, 1991)	UF6 Value per kg U as UF6 12 Months Ago (July 31, 1990)
Australia (dollar)	84.72	76.97	63.16	33.06	35.55	41.05
Belgium (franc)	2,370	2,199	1,651	924.60	1,016	1,073
Canada (dollar)	75.97	67.37	57.62	29.64	31.12	37.46
EC (ecu)	56.17	52.04	38.92	21.91	24.04	25.30
Finland (markka)	277.03	253.02	188.27	108.08	116.86	122.38
France (franc)	391.18	362.12	268.50	152.62	167.25	174.52
Germany (mark)	115.04	106.88	83.15	44.88	49.37	54.05
Italy (lira)	85,870	79,419	58,748	33,502	36,681	38,186
Japan (yen)	9,067	8,121	7,400	3,538	3,751	4,810
Netherlands (guilder)	129.72	120.41	90.50	50.61	55.61	58.82
So. Africa (comm. rand)	189.06	170.32	129.97	73.76	78.67	84.48
So. Korea (won)	48,288	42,735	35,776	18,840	19,738	23,254
Spain (peseta)	7,204	6,699	4,932	2,811	3,094	3,206
Sweden (krona)	417.46	385.87	292.74	162.87	178.22	190.28
Switzerland (franc)	100.52	91.66	67.97	39.22	42.33	44.18
Taiwan (dollar)	1,756	1,583	1,340	685.20	731.11	871.01
UK (pound)	39.13	36.33	27.06	15.27	16.78	17.59
US (dollar)	66.00	59.00	50.00	25.75	27.25	32.50

[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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RECENT DEVELOPMENTS

South Africa

On July 8, South African President F. W. deKlerk signed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). DeKlerk cited improving relations among the superpowers and their efforts to reduce the arms race, Zambia and Tanzania becoming NPT signatories, and the lessening threat of conventional military conflict in southern Africa, as reasons that contributed to South Africa's decision to sign the NPT.

In a concurrent development, on July 10, US President George Bush lifted all US economic sanctions against South Africa, stating that the process of eliminating apartheid was now irreversible. South Africa had already met four of the five conditions for lifting sanctions, as set forth in the *Comprehensive Anti-Apartheid Act of 1986* (*CAAA*). The five conditions were as follows:

- Legalization of political parties.
- Lifting of the national state of emergency.
- Initiation of good-faith negotiations toward a non-racial government.
- Release of all political prisoners.
- Repeal of apartheid laws on racial segregation.

Early in 1991, in an action supporting the requirement for the repeal of apartheid laws, DeKlerk requested that Parliament dismantle the last remaining legal foundations of discrimination:

- *Group Areas Act*—segregated residential areas of blacks from whites.
- *Land Acts*—made it illegal for blacks to own land, unless the land was within specially designated homelands.
- *Population Registration Act*—required South Africans to register by racial group.

The one unfulfilled condition of the *CAAA* was the release of all political prisoners. Determination of how this stipulation was being met was based largely on the definition of a "political" prisoner. South Africa recently claimed that it had released all political prisoners, as they were defined under the *CAAA*. The African National Congress (ANC), under president Nelson Mandela, vigorously debated with President Bush's staff over the *CAAA* definition, and countered that South African officials still imprisoned nearly one thousand political prisoners. South African officials rejected the ANC claim, stating that the additional prisoners the ANC had identified were being held for acts of violence, and claimed that those acts nullified the prisoners' status as political prisoners under the *CAAA*.

As promised, President Bush advised Nelson Mandela of his decision before concluding negotiations with the DeKlerk government. Final resolution of the political prisoner issue was made on June 28, although details were not available.

The lifted US sanctions had banned:

- Corporate investments and loans to South African governmental agencies.
- Landings at US airports by any aircraft operated by South African Airways.
- Sale of military equipment, nuclear material, and strategic technology to South Africa.
- Importation of South African uranium ore and oxide, steel, iron, aluminum, coal, textiles, and agricultural products.

As a result of the US actions, Japan and Israel both may soon lift their remaining sanctions against South Africa. They had indicated a willingness to lift sanctions once the USA had lifted its sanctions.

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WASHINGTON FOCUS

by Linda L. Gunter

Activity increased in Congress as it prepared to adjourn for its summer recess in August. While the omnibus energy strategy bill has temporarily stalled in the Senate, work continued in the House. In a July 24 event at the White House, President Bush threw his support behind S 1220, the Johnston-Wallop energy policy bill. The Senate is expected to vote on the bill when it returns in September. The House Energy & Commerce Committee has begun markup of its energy bill, but with several committees having jurisdiction, it probably will not reach the full House for a vote before next summer.

Energy Appropriations

◇ During the last week of July, both the House and Senate approved the entire $21.8 billion Energy and Water Development FY 1992 Appropriations Bill (HR 2427). Advanced nuclear energy research and development (R & D) will receive approximately $59.5 million from a total energy R & D allocation of almost $3 billion. DOE's high-level waste program will receive $275 million (about $30 million less than DOE's request). The environmental restoration and waste management account will receive $4.28 billion, which is $60 million more than DOE requested.

AVLIS Funding

◇ On July 30, House and Senate Appropriations Committee conferees met to work out a compromise on funding levels for DOE's uranium enrichment program. While the Senate version of the bill did not provide full funding, it did provide more than the House version, and it allocated funds for proceeding with the Commercial Deployment Contractor Request for Proposals. Unfortunately for the AVLIS program, the conferees agreed to the House version of the bill, leaving AVLIS with only $163.6 million—a reduction of $50 million from the DOE request. If the President signs the bill into law, not only will the program have been cut by over 20 percent, but the deployment decision will be delayed until 1993. In the bill, the total program was reduced an additional $24 million, to $1.313 billion, even though projected revenue is $1.547 billion—an excess of $234 million over the appropriation. The conferees decided to fund the super collider project instead.

Draft of House Uranium Enrichment Bill

◇ In another legislative development, two House committees with jurisdiction over uranium enrichment are rumored to be discussing a joint bill. Staff activity has increased substantially in the last week and a committee draft of the legislation should be available for comment within the next several weeks. Hearings on the bill could begin in September.

USCEA Nuclear Fuel Supply Committee

◇ USCEA's Nuclear Fuel Supply Committee met on July 30. Approximately 75 people heard reports from the various committee and task force chairmen. Jim Glasgow, chairman of the Fuel Supply and Trade Task Force, spoke about the status of two Nuclear Cooperation Agreements the USA has negotiated with Hungary and the Czech and Slovak Federal Republic. The agreements are currently receiving Congressional consideration, and barring unforeseen objections, the agreements will be ratified sometime early next year.

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The main topic of the meeting was industry concern about Nuclear Regulatory Commission (NRC) user fees. A law Congress passed last year authorizes the NRC to collect 100 percent of its budget through user fees for the next five years. Ron Simard of NUMARC explained his efforts to work with the NRC on its budget, in order to prevent the industry from becoming even more regulated. He also indicated the industry also needs to lobby Congress to lift the 100-percent user fee requirement in 1994 and collect data to demonstrate that NRC regulatory activities are excessive. As evidence, he noted that in the past five years, nuclear power plants have gotten demonstrably safer. During this time, there has been little growth in the industry; yet the NRC budget has grown 30.5 percent or about 7 percent per year. He also warned the industry to expect about a 10-percent increase in user fees in FY 1992 because the entire NRC budget has grown about 10 percent.

Sandford I. Rock of Allied-Signal Company talked about his successful efforts to reduce the user fees for convertors by $200,000 per year. He said that these user fees were another form of taxation, which in a highly competitive world market, made the convertors less competitive. He also questioned whether NRC safeguards are necessary for convertors, since convertors are essentially chemical process plants similar to uranium mines and mills, which have fewer regulations and thus, lower user fees. The convertors have asked the NRC to demonstrate a strict cost-benefit between the services provided and the user fees charged. He noted that the state of Illinois has an agreement with the NRC allowing state regulation of some nuclear facilities. However, the NRC refuses to allow the state to regulate the Allied plant, claiming national security implications, thus retaining the money collected from the user fees. Comments from the audience after his presentation indicated that fuel cycle facilities are taking a close look at what licenses they hold; if some licenses are not absolutely necessary, they likely will not be renewed.

ITC requested to Investigate Uranium Imports

◇ Responding to a May 24 letter from four senators on the Senate Energy and Natural Resources Committee, the Senate Finance Committee sent a letter on July 25 to the International Trade Commission (ITC) requesting a report on the effect on US industry of imports of uranium and enriched uranium from non-market countries. The ITC was requested to assess the impact of enriched and natural uranium imports from non-market economies, and provide information about the uranium enrichment industry in the USA and in non-market countries, such as the Soviet Union, and the People's Republic of China. The letter requires the ITC to submit its report by July 25, 1992. ITC staff indicate they will begin collecting information in September.

House Rejects a DOE Reprogramming Request

◇ In a somewhat unusual request, DOE asked for Congressional approval to reprogram $15 million of uranium enrichment program funds from FY 1991 to close out activities on the defense side of the Special Isotopic Separator (SIS) program. The SIS was a sister program of AVLIS, sharing laser research at Lawrence Livermore National Laboratory. The House rejected the request, noting that funds for close out of the SIS program had been allocated in the Defense Authorization Act of FY 1991 and should be used as allocated.

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INDUSTRY BRIEFS

Argentina and Brazil Sign Non-Proliferation Accord

At a meeting of Latin American leaders in Guadalajara, Mexico on July 18-19, the presidents of Argentina and Brazil signed an accord on the peaceful uses of nuclear energy. The treaty outlines specific measuring systems for the accounting of nuclear-related material. The two countries are continuing to work out other details, which will eventually lead to full entry into force of the Treaty for the Prohibition of Nuclear Weapons in Latin America (Tlatelolco Treaty) and implementation of full IAEA non-proliferation safeguards.

◆ ◆ ◆

Total/Malapai Announce Restart of Two ISL Projects

Total Minerals, operator of the Malapai/Total joint-venture uranium properties at Christensen Ranch, Wyoming, and El Mesquite, Texas, announced that it would restart those two projects as of August 1. The in-situ leach (ISL) projects are being restarted to establish production costs after a lengthy period of standby status. Production from the two projects will be used to fulfill long-term contract commitments. Additional information regarding these projects can be found in the *EXPLORATION AND DEVELOPMENT UPDATE* in this report.

Yankee Rowe License Extension Request May Be Dropped

In mid-July, officials at Yankee Atomic Electric Company postponed submitting to the Nuclear Regulatory Commission (NRC) a operating license-extension request for Yankee's Rowe, Massachusetts nuclear plant. The 167-MWe PWR began commercial operation in 1961, and is the oldest operating commercial reactor in the USA. Concern about the level of embrittlement of the reactor containment vessel has made the plant a center of debate in the US nuclear industry's efforts to obtain its first 20-year license extension.

The NRC recently reversed its earlier approval of the license extension ruling, at the urging of its new chairman, Ivan Selin, who objected to his predecessor's approval of a ruling prior to finalization of the wording. The reversal requires that the commission consider the ruling's final wording before granting approval. The reversal essentially forced Yankee to delay submittal of its extension request.

This delay, new uncertainty of the final ruling's requirements, and vocal opposition to the plant's current operation has Yankee reconsidering how and when to proceed with a license extension request, if at all. An NRC official stated that the plant will not be permitted to restart after an April 1992 refueling outage until there is evidence that the embrittlement is within NRC standards.

Korea Selects ABB and GE To Supply Two New Plants

Korea Electric Power Corporation (Kepco) has selected the suppliers for its Uljin 3 and 4 units. These 943-MWe (net) reactors are planned for completion by 1998 and 1999, respectively. ASEA Brown-Boveri/Combustion Engineering (ABB-CE) was selected to supply the nuclear steam supply systems, and General Electric Corporation (GE) was selected to supply the steam turbines.

ABB-CE got the bulk of the contracts, worth approximately US$200 million, mostly due to its having supplied these same systems for Yonggwang 3 and 4, which are to be completed in 1995 and 1996 respectively, and due to its willingness to transfer technology to Korea, which has a long-term goal of energy self-sufficiency. A large part of the reactor components will be Korean-built licensed designs.

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Canadian Consortium Signs Cleanup Deal With Wismut

A consortium of Canadian firms have signed an agreement with Wismut AG, the former East German-Soviet mining company, to provide expertise and technology to clean up over 40 mine and tailings sites. Initial preparations and site analysis will begin this fall. Estimates for the cleanup range from US$7 billion to as high as $20 billion, and may require 10-15 years.

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US Reactors Reach Records

On July 22, GPU Nuclear Corporation's 808-MWe (net) Three Mile Island 1 (TMI 1) unit surpassed the standing record of 477 days of continuous operation for a light water reactor. On July 24, the reactor automatically tripped due to an error during testing, and was off-line for a couple days. The old record was set in 1988 by Omaha Public Power District's 478-MWe Fort Calhoun 1 reactor.

The opportunity is now available to the 1,135-MWe Wolf Creek unit, operated by Kansas Gas & Electric Company, to surpass the 480-day TMI 1 record. The Wolf Creek reactor can increase the record to 486 days if it operates continuously until its scheduled September 19 refueling outage.

Two other US reactors surpassed the 100-billion kWh lifetime generation mark. Duke Power's 846-MWe Oconee 1 unit reached that achievement at 10:39 a.m. on July 28, the first ever to do so in the USA. The following day, American Electric Power Company's 1,202-MWe Cook 1 unit also reached that mark. Previously, only reactors in Germany and Belgium had attained this level of generation.

Bulgaria To Close Kozloduy VVER-440s For Upgrading

In mid-July, the government of Bulgaria announced that two of the first-generation VVER-440s (Model 230) at the Kozloduy station will be closed, on August 15 and September 15, for upgrading. The upgrading, much of it to improve plant safety, will be performed by a consortium of French, German, Belgian, and British firms.

The Kozloduy station has four VVER-440s, and two VVER-1000s. Since both VVER-1000s are not in operation—one is down for lengthy repairs and the other is awaiting initial start up—only two of the four VVER-440s will be shutdown for upgrading at any one time. The remaining two reactors must be kept operating to meet Bulgaria's electricity demand.

During June, an IAEA OSART (Operational SAfety Review Team) inspected the four VVER-440s, and the team's report cited numerous safety concerns about equipment and operating procedures. The OSART did not recommend that the reactors continue to operate.

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China Agrees To Sign NPT

China's Premier Li Peng announced on August 10 that China will sign the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Premier Li stated that China had agreed "in principle" to sign the NPT, and would do so without any conditions, but did not announce a date for the signing to take place. China was the last major nuclear power that had not agreed to sign the NPT.

Japanese Centrifuge Enrichment Plant Receives Final Approval For Start-Up

Japan Nuclear Fuel Industries' (JNFI) centrifuge enrichment plant at Rokkasho-mura, in Japan's Aomori Prefecture, concluded a safety agreement with the Aomori and Rokkasho-mura governments in late July, thereby permitting the plant to begin operation. JNFI had received final national approval in late May when the Science and Technology Agency issued a facility inspection certificate, permitting an initial capacity of 150,000 SWU per year. The plant should be in full operation by early 1992.

The safety agreement covers 22 issues, such as notification of nuclear material transportation, spot inspections following accidents, compensation for accidents, and so forth. The national government has authority for safety regulations for nuclear-related facilities, while local governments are given very little authority and must pursue their efforts through national government channels. For this reason, the JNFI safety agreement with the local governments carries little legal weight, but is more in the spirit of a gentlemen's agreement, indicating JNFI's desire to work with the local communities in their safety concerns.

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INTERVIEW WITH MR. ALBERT A. SHISHKIN AND MR. BORIS V. NIKIPELOV OF THE SOVIET UNION'S MINISTRY OF ATOMIC ENERGY AND INDUSTRY

Mr. Albert A. Shiskin
General Director of V/O Techsnabexport (TENEX)

Mr. Boris V. Nikipelov
First Deputy Minister of the Ministry of Atomic Energy and Industry

NUEXCO first interviewed Mr. Nikipelov in the fall of 1989 (Monthly Report #255, November 1989, page 21) on the subject of V/O Techsnabexport (TENEX) and its growing commercial presence in the international nuclear fuel market. In that interview, Mr. Nikipelov, First Deputy Minister of the Ministry of Atomic Energy and Industry (MAEI), concluded with a discussion of the non-nuclear production capability within the Ministry. He also emphasized the mutual benefits that might be derived from increased international trade in these areas. In this follow-up interview, Mr. Albert A. Shishkin, General Director of TENEX, joins Mr. Nikipelov in giving us more detail on the state-sponsored program of converting the production capacity of the Soviet nuclear fuel cycle and its supporting infrastructure from defense and power generation to commercial purposes.

NUEXCO — Mr. Shishkin and Mr. Nikipelov, what is the relationship between your organization, Techsnabexport, and the Ministry?

MR. SHISHKIN — The Ministry for Atomic Energy and Industry was established in 1989 by combining two Ministries: Atomic Energy and Medium Machine Building. The Ministry's primary mission is the building and operation of the commercial nuclear fuel cycle. TENEX, a foreign trade organization within MAEI, is best known for its role in support of the Ministry's primary mission—the promotion of international trade in the goods and services associated with the civilian nuclear power business. But, TENEX's role goes far beyond nuclear power; it represents all of the various industrial and research organizations of MAEI in their import-export activities.

NUEXCO — What are those other activities of MAEI?

MR. NIKIPELOV — In addition to the nuclear fuel cycle, the Ministry is responsible for nuclear instruments, including those used for medical research and radiation therapy. The Ministry manufactures secondary products or by-products from its nuclear fuel cycle production. And in accordance with our nation's latest five-year economic plan, whose top priority is to improve availability of consumer goods, the Ministry has also acquired responsibility for development of the capability to manufacture dairy equipment and for the production of a number of durable consumer goods, such as videocassette recorders and other consumer electronics items. Thus, while TENEX is known primarily for its sales of enriched uranium and SWU, commercial officials also sell medical instruments, accelerators, lasers, rare earths, alloying elements, and related products—all important facets of our conversion program.

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NUEXCO — As the Soviet Union converts its nuclear sector to commercial applications, the sector can be expected to generate large amounts of hard currency. How will those funds be used? And will they be controlled by MAEI, by TENEX, or by some other part of the Soviet government?

MR. SHISHKIN — First, these funds are not going to be used for military purposes of any kind. Second, they will not be used for the development of nuclear power stations of any kind. These funds can be used for improving reactor safety, a concern of all nations, not just of the nations in which power reactors are located.

The hard currency generated by our conversion activities will be used for three main purposes:

- The purchase of technology and equipment for production, processing, and packaging of milk and milk products.
- The purchase of durable consumer goods (not foodstuffs or grain) and equipment for the manufacture of consumer goods.
- The purchase of equipment and technology for the Soviet manufacture of personal computers (not for military use).

Part of the funds will be used to cover the Soviet Union's participation in related production joint ventures. Other purchases will be made through barter transactions, so buyers will be able to see the purpose to which the currency is applied. Depending on the volume of hard currency generated, part of the foreign exchange earnings also may be used for the purchase of technology and equipment for the reduction and processing of industrial pollutants and waste products.

NUEXCO — What other products and services are derived from the Ministry's activities?

MR. SHISHKIN — Sales of:

- Natural uranium and other nuclear fuel components.
- Equipment using radioisotopes, plus the radioisotopes themselves (Co-60, Cs-137, Pu-238, Np-237) and products using tritium.
- Stable isotopes.
- Instruments and measuring equipment.
- Accelerators, lasers, and associated equipment.
- Beryllium and beryllium ceramic.
- Zirconium.
- Lithium.
- Scandium.
- Rare earths.
- Molybdenum.
- Nitrates and phosphates for fertilizers.
- Emeralds and colored stones.

Based on our technology, we are also establishing joint ventures with foreign manufacturers, the operations of which are located in the USSR. We will strive to increase trade volume, not only for the benefits to our economy, but because trade is a motive for progress and a stimulus for peace.

NUEXCO — What historical developments have led to the current program of conversion?

MR. NIKIPELOV — Nuclear manufacture in the USSR was launched in the late 1940s and early 1950s to warranty the country's defense capability and strategic parity in the domain of nuclear weapons. Being geared to resolve not only defense problems, but also other essential issues of national economy including peaceful use of atomic power, the nuclear sector has been expanding dynamically and is represented today by an array of major R&D and production complexes with developed internal links and intra-sectoral cooperation and specialization, including:

- Uranium mining and processing works, sublimation and enriching (uranium isotope separation) plants, factories making fuel assemblies and nuclear propulsion units for various uses, and radiochemical plants processing spent nuclear fuel for maintaining a closed fuel cycle (these plants constitute a fuel cycle subsector).
- Nuclear power generation.
- Defense works.
- Machinery- and instrument-making factories.
- R&D and engineering-design institutions conducting fundamental and applied research.

Because of the ongoing process of normalization of international relations and successful US-Soviet efforts focused on the progress of disarmament, the sector's portfolio of orders for nuclear weapons materials has been dwindling. The stockpiling of highly enriched uranium for military purposes was completely terminated as far back as 1988. Five major reactors for plutonium production have been closed down, as well as a radiochemical plant for plutonium extraction and purification.

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This military reduction overlapped a drastic slowdown in development of the country's nuclear power generation, which occurred for a number of reasons, the Chernobyl disaster having been the primary one. Consequently, not only has the demand for natural and enriched uranium sharply diminished, but reorientation has become a necessity: reorientation of production facilities at instrument- and machinery-making factories, of construction and installation companies, and of the nuclear industry's entire manufacturing capability.

NUEXCO — What sorts of goals have been established for this rather ambitious conversion program?

MR. SHISHKIN — The sector's specialists have approached the problem comprehensively by working out objective-oriented scientific and technological conversion programs tied to the main lines of activities. The overall goal has been formulated to:

1) Make fuller use of the available engineering concepts and technological developments of the sector's R&D and design institutions.
2) Ensure the optimum use of existing equipment, personnel skills, and specific performance features of the established production teams of the factories and plants.
3) Find new applications for the raw and processed stock produced by the sector's works, as well as the materials and technologies already in use, and employ them in parallel with the main production of fissionable materials as a basis for launching the output of new products for the national economy.
4) Retain the nuclear sector's distinctive product quality and comprehensive high-tech attitudes, though this time not only in the traditional output of the industry, but also in goods produced for the national economy in general.

NUEXCO — Can you give our readers a bit more detail on the organizations and facilities involved in the Ministry's portion of this national program of conversion?

MR. NIKIPELOV — The sector's R&D institutions engaged in both fundamental and applied research are all located in or near Moscow and include:

- I. V. Kurchatov Atomic Power Institute.
- Institute of High Energy Physics in Protvino.
- Institute of Theoretical and Experimental Physics.
- All-Union Scientific-Research Institutes of Inorganic Materials and Chemical Technology.

Engineering-design institutions include:

- Scientific Research and Design Institute of Power Technologies.
- All-Union Scientific Research Instrument-Making Institute.
- All-Union Scientific Research Institute of Nuclear Technologies.
- Sverdlovsk Institute of Chemical Engineering.

The conversion program also includes other institutions specializing in the design of nuclear reactors, instrumentation, and equipment. These institutions have been developing advanced technologies that hold a high promise of profitable implementation. The manufacturing facilities of the sector are many-faceted:

- Instrument manufacturing facilities producing devices not only for the industry's own use, but also for application to other issues involving radioactivity, such as industrial and medical units with radioactive isotopes.
- Engineering factories producing essential equipment for nuclear power plants (for example, the Atommash factory in Volgodonsk), machinery for mining works, chemical plants, etc.
- Large-scale construction and installation companies and works fabricating construction materials.

In their entirety, these institutions make the sector capable of restructuring itself on short notice and launching new production facilities for implementing new and promising developments.

NUEXCO — Can you describe for us some of the ways in which technology developed for the nuclear fuel cycle can be adapted to commercial purposes?

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MR. NIKIPELOV — Yes, let us begin with two examples.

- The traditional hydrometallurgical technologies of the nuclear fuel cycle, with their comprehensive processing of ore materials, also yield such by-products as molybdenum, rhenium, scandium, and others.
- The production teams and equipment of the works that mine uranium ores may be employed, under conversion programs, to develop other adjoining, undeveloped mineral deposits.

Reflecting these two aspects, the objective-oriented program, "Prospective Materials, Rare Earths, Nonferrous and Noble Metals, and Articles Made of Them", envisages stepping up the volume of extraction and production of metals and their compounds, and high-purity alloys, among which are: tungsten, molybdenum, tantalum, vanadium, niobium, scandium, tin, manganese, calcium, synthetic quartz, titanium oxide catalysts, ion-exchange resins, and various ceramics. The program also anticipates increased production of corresponding finished items such as roiled metal, master alloys, powders, and pure compounds.

The annual output of this program is planned to reach two billion rubles by 1995. The major objective of this raised output is to curtail sharply the country's import of the products listed, and given adequate mutual interest, their export appears to be quite feasible. The feasibility is supported by the sector's employing its own sorption and extraction technologies in producing the metals, and ensuring high economic indicators and product quality. In addition, the industry's enterprises are going to employ these technologies for the increased output of gold. Our specialists are fully prepared to introduce the technologies to enterprises abroad. The purity of the yielded metal (to 99.99%), the high factor of its recovery even from lean ores containing 1-2 grams per ton, and the technology's economic ratings, make renovating existing facilities or launching new ones profitable.

Worth special mention is the sector's planned production increase of rare-earth metals such as cerium neodymium, praseodymium, gadolinium, europium, yttrium, erbium, and others. We are aiming at the output of not only the metals and their alloys, but also of finished products, such as ceramic and piezoceramic materials and articles, neodymium- and samarium-based magnets, phosphors for color TV, chemical power cells (CPC), and other goods.

NUEXCO — Is it true that you have a significant capability in the area of industrial diamonds? If so, what sort of capacity do you have?

MR. NIKIPELOV — Yes. Let us consider specifically production of technical diamonds and output of natural diamonds for various applications. This activity is based on a number of technologies developed within the industry for producing technical diamonds and applying diamond films onto surfaces of components, for example, computer memory disks. The technologies allow flexibility in putting out technical crystals of different grain sizes, and in quality and production costs, which provide for a broad spectrum of their application in diverse processes. Moreover, the territory adjoining one of the Ministry's production centers in Kazakhstan houses a unique deposit of technical diamonds, combining magnificent hardness ratings with facilitated mining conditions.

Using the diamonds, the sector has been mastering the manufacture of various tools, composites, lapping and polishing powders, and lubricants. Planned for the present five-year period is the output of natural technical diamonds in an annual volume up to 1.5 million carats, and of various 5 to 45 micrometer powders of low production cost.

NUEXCO — Do you have commercial capabilities in other stones?

MR. SHISHKIN — Yes. The output of color and facing stones such as marble, granite, granodiorite, amazonite, and others is rising to an annual volume of 30-50 thousand cubic meters. The industry has increased its production of zeolite, and launched the fabrication of a wide assortment of jewelry and bijouterie, from color stones and metallic zirconium to cut emeralds, gold, and silver.

NUEXCO — What about rare earths and rare metals?

MR. SHISHKIN — Yes. The output of the above-mentioned rare-earth and rare metals involves the sector's metallurgical works. Lately, the latter have been initiating various new lines of production based on the metals they have been producing traditionally: aluminum, zirconium, and lithium. Their conversion program uses pure aluminum for making computer memory disks and casting wheels for motorcycles and mopeds; produces zirconium alloys

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and zirconium ceramics; and employs lithium and pure manganese dioxide to produce CPCs and other diverse products.

NUEXCO — How can something like a radiochemical plant be turned to commercial use?

MR. NIKIPELOV — With their highly specific products, radiochemical plants are the hardest to convert. However, they can be reprogrammed either to process the spent fuel of nuclear power plants or expand the output of radioisotope products. Thus, the radiochemical complex near Chelyabinsk has adapted its facilities, formerly employed for defense purposes, to processing the depleted fuel of water-moderated, water-cooled power reactors, and is also stepping up the output of radioactive isotope sources. These lines of production could serve as a basis for broader scientific, technological, and economic cooperation (in joint ventures) with foreign partners.

The specific traits of radiochemistry (remotely controlled plants and technologies capable of high degrees of purification and separation), make it possible, by way of conversion, to initiate the output of extra-pure materials such as silicon, gallium, and other elements for electronics. For this capability the sector has elaborate programs for development and production of components for fiber optics and systems incorporating such components, for extra-pure materials, and for components and functional devices in the area of microelectronics.

NUEXCO — What other areas are targeted for conversion?

MR. SHISHKIN — The sector's machinery- and instrument-making factories supporting the main production lines have not been overlooked in conversion programs. They are increasing considerably the output of process equipment for treating milk and dairy products, to be marketed in a package including post-warranty servicing.

A special part of the program is the development and manufacture of medical instrumentation and equipment. Numerous items enjoy demand on the international market such as cardiac valves and accelerators for topography and therapy.

The industry plans a fivefold increase of its output of manufactured consumer goods by 1995. This output will be based on the materials that are to become traditional for the sector in the nearest future: washing machines and other articles incorporating piezoceramics, and neutralizers of exhaust gases from automotive vehicles. We are also planning to manufacture household radioelectronic devices, ozone-safe refrigerants, household chemicals, and fertilizers.

NUEXCO — It appears that successful conversion will depend on technical cooperation with foreign organizations, as well as on sales to foreign customers. Would you agree?

MR. NIKIPELOV — Yes. The industry's high scientific and technological potential, its multifaceted and multi-product industry, and the shrinking of State orders for traditional uranium products have made enterprises and institutions eager to establish broader international links and to build a higher profile on the world market.

We seek to increase the volume of sales of our traditional products and to broaden the use of our technologies abroad. At the same time, we aim to introduce foreign technologies to our enterprises in areas where we are lag behind, such as consumer goods production and the manufacture of equipment for the processing sectors of the agro-industrial complex.

Enterprises are ready to use diverse ways to achieve these goals, provided both sides involved benefit from them, such as setting up joint ventures, joint-stock companies, or concluding barter deals.

NUEXCO — I understand you already have several joint ventures in operation. Could you describe them?

MR. SHISHKIN — The Ministry has launched eleven successfully operating joint ventures, that are active in a broad range of goods and services:

- Assembling data processing equipment, maintaining that equipment, and developing its software:
  - INCOMPEX–USSR/Finland/Germany
  - UNICOM–USSR/Austria
  - INTERDUM–USSR/Great Britain
  - IDOL–USSR/Hungary
- Manufacturing Polaroid-type cameras:
  - SVETOZOR–USSR/USA
- Manufacturing automatic milk dispensing units:
  - TETRA-LUNCH–USSR/Sweden

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- Manufacturing flowmeter and other devices for diagnostics:
  - – KRONA-ISKRA–USSR/Germany
- Cutting emeralds:
  - – EMURAL–USSR/Panama
- Making isotope products:
  - – ISOFLEX–USSR/Great Britain
- Making rare-earth products:
  - – EUROSTRON–USSR/Poland
- Recycling industrial and municipal waste:
  - – UTILEX–USSR/German

The sector's plans include: establishing new joint ventures for making jewelry of gold and precious stones; producing and working marble and granite; manufacturing furniture, window units, milk trucks, valves and fittings for milk lines, linoleum, computer disk drives, and medical gamma-ray chambers.

NUEXCO — Assuming these conversion activities produce goods that are sold abroad, thereby generating foreign exchange, how will the domestic supply of consumer goods be affected?

MR. NIKIPELOV — The conversion framework includes setting up new enterprises, thus making it possible to saturate the domestic market with consumer goods. Among these enterprises are: a toothpaste factory in Shevchenko, factories making magnetic tape and audio cassettes in Krasnoyarsk, television assembly factories in Krasnoyarsk and Sverdlovsk, a factory assembling laser video and audio players and fabricating video disks in Sverdlovsk, a microwave manufacturing factory in Frunze a factory in Nizhny Novgorod making units for satellite TV systems, and "artificial kidney" assembly lines in Sverdlovsk.

NUEXCO — What sort of promotional activities have you undertaken in this area?

MR. SHISHKIN — In order to better inform their potential partners, the sector's enterprises took part in the "Conversion '90" exhibition held in Munich, Germany in 1990, and they are getting ready for the "Conversion '91" exhibition to be held in Bologna, Italy. We seek to establish permanent information centers in the USA, the Republic of Korea, and Spain.

NUEXCO — In conclusion, is there any message you would like NUEXCO's readers to pass on to their colleagues?

MR. SHISHKIN — Yes. Substantial increases in trade between my country and those of your readers are highly beneficial in promoting peace, and that is even more important than the very real economic benefit to be gained. Considering the possible benefits of world peace, we look forward eagerly to helping to strengthen existing trade bonds between our country and those of your readers. In broadening our scientific-technical and trade contacts, we have great hopes for assistance on the part of our traditional partners, such as NUEXCO in the USA, Urangesellschaft in Germany, and Cogema in France. Conversion is an international task in which it is both necessary and more efficient to undertake jointly.

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URANIUM EXPLORATION AND DEVELOPMENT UPDATE

Large inventories and depressed market prices continue to dampen any significant exploration and development in the world's uranium industry. Minimal activity is ongoing, as the exploration industry tries to survive. Several consolidations within the uranium industry have highlighted the year thus far.

General Atomics — Chevron Resources

In June, Chevron announced that a definitive agreement had been reached with General Atomics (GA) of San Diego, California, whereby GA will purchase all of Chevron's uranium assets in the USA and Canada. These assets include the Panna Maria uranium mill, a 55-percent share of the Rhode Ranch uranium mine in south Texas, the Mt. Taylor uranium mine in New Mexico (the largest known uranium deposit in the USA), and exploration properties in Saskatchewan, Canada. Along with Unocal's recent sale of its Sweetwater property, the agreements mark the exit of the last US oil companies from the uranium industry in the USA. Terms of the GA-Chevron agreement were not released.

General Atomics — Tennessee Valley Authority (TVA)

GA also purchased TVA's Powder River Basin uranium properties in Wyoming during May. GA paid $1.6 million for several leases and claims containing reserves estimated at up to 10 million pounds equivalent U_3O_8.

Power Resources Inc. — Tennessee Valley Authority

At the end of April, Power Resources Inc. (PRI) acquired all of TVA's in-situ leaching (ISL) properties in the Gas Hills region of Wyoming, with estimated resources of as much as 20 million pounds U_3O_8. TVA retained the open pit properties in the Gas Hills, which contain uranium resources of up to five million pounds.

Unocal — Green Mountain Mining Venture

Unocal Corporation announced in July that it had agreed to sell its Sweetwater uranium property to the Green Mountain Mining Venture, a joint venture between Kennecott Corporation, and US Energy Corporation and its subsidiary Crested Corporation. The joint venture will purchase the Wyoming property and its mill, and will assume specified environmental liabilities. The purchase will enable the joint venture to use the existing mill to process ore from its nearby Green Mountain project, once it begins operation.

Rio Algom — URI

At the end of May, Rio Algom, Ltd. (RAL) and Uranium Resources, Inc. (URI) agreed to a merger in which Rio Algom Mining Corporation (wholly owned by RAL) will acquire all outstanding URI shares. Rio Algom already owned eight percent of URI, and will pay US$6.40 per share, or approximately US$41 million, to buy the outstanding shares. Rio Algom likely will benefit from URI's current contracts and its technical expertise, particularly with respect to ISL technology. Some of URI's solution mining properties include: Kingsville Dome and Rosita in Texas, and Churchrock in New Mexico. The transaction probably will be concluded by the third quarter of 1991.

Energy Fuels — Oren L. Benton

On January 16, 1991, John Adams, Chairman of Energy Fuels, and Oren Benton, owner of NUEXCO, announced a joint venture involving all of the uranium operations of Energy Fuels. Energy Fuels, which was founded in 1972, has been the largest US uranium producer since 1986. Its mining operations, however, are currently on standby. The company holds over 20 million pounds of uranium reserves located in Mojave County, Arizona.

Energy Resources of Australia (ERA) — Pancontinental

In early July, North Broken Hill Peko (NBH) announced its decision to purchase the Jabiluka uranium deposit from Pancontinental for A$125 million. But later in July, ERA, 65-percent owned by NBH, announced it, rather than NBH, would purchase Jabiluka. Pancontinental will sell 100 percent of Jabiluka after exercising a 1987 option to acquire Texaco's 35-percent share for A$30 million. The transaction, which was in negotiation for more than six months, will almost certainly result in the eventual processing of Jabiluka ore (estimated to contain more than 450 million pounds equivalent U_3O_8) at ERA's nearby Ranger mill. ERA owns and operates the Ranger facility, approximately 15 km from the Jabiluka site. Although development of the ore body is not expected in the near future, this transaction clearly sets the stage for mining Jabiluka, even if the government's current uranium policy remains unchanged.

In June, the Australian Labor Party (ALP), voted to maintain its current three-mines policy and block any expansion of

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Australia's uranium industry. This decision, made at the ALP's biennial conference, came as something of a surprise, since prior to the conference, the ALP's own uranium policy review committee and several high-ranking party officials had recommended abandoning the restrictive policy.

In mid-July, it became openly known that NBH's intention was eventually to develop the Jabiluka deposit, process the ore at the Ranger mill, and export the ore under Ranger's existing license (thereby circumventing the government's uranium policy restrictions). Australian Prime Minister Bob Hawke declared, through the news media, that he strongly opposed any such intention and that he would stop any efforts to mine Jabiluka while the three-mines policy remained in effect.

Ontario Hydro Contract Renegotiations

Another important development during the first half of 1991 was Ontario Hydro's long-term uranium supply contract negotiations with Denison Mines and Rio Algom. Ontario Hydro exercised an escape clause in its long-term contracts with both producers, allowing it to terminate deliveries under the contracts if it had paid substantially greater than market price for five consecutive years.

Following unsuccessful price negotiations, Ontario Hydro gave notice to Denison Mines that it would terminate its contract at the end of 1992. During 1990, Denison downsized its Elliot Lake, Ontario operation to approximately 60 percent of its previous level. Since Ontario Hydro was Denison's sole Elliot Lake customer, Denison had planned to further reduce its production rate in June 1991 from 2.7 million pounds U_3O_8 per year, to 1.4 million pounds, the amount scheduled for delivery under the contract. However, Denison cancelled its plans to scale back production after Ontario Hydro agreed to take delivery of the remaining contract quantity under an advanced schedule. This action will permit the mine to continue producing at current levels through the first quarter of 1992, after which the mine will close.

On the other hand, Rio Algom and Ontario Hydro managed to successfully conclude a revised contract. Ontario's ruling New Democratic Party was also involved in the negotiations. Under terms of the agreement, Ontario Hydro will purchase 3.7 million pounds U_3O_8 under the higher-priced terms of the original contract for delivery through 1993. Subsequent deliveries during 1993-1996 will total 5.9 million pounds, and will be much closer to current market prices. In addition, Ontario Hydro agreed to contribute C$65 million between 1991 and 1993 to the Northern Ontario Heritage Fund Corporation for retraining workers and reducing municipal debt at Elliot Lake.

EXPLORATION ACTIVITY

All of the industry consolidations and developments will affect, directly or indirectly, the struggling exploration and development industry. Declining market prices continue to make exploration programs even less attractive. Therefore, only limited uranium exploration activity is occurring in most regions of the world.

Australia

Due to the continuation of the Australian government's three-mine policy, uranium exploration and development remains at very low levels. Some drilling was conducted at the Kintyre deposit in Western Australia to further explore, define, and evaluate the deposit, but most exploration activity in Australia has ceased until government policies change.

United States

Total exploration drilling rigs in operation in the US industry ranged from zero in January, to sixteen in June. During the same interval, the number of development rigs ranged from 10 to 20. Traditionally, the peak drilling season in the USA is late summer and fall, during which the total rig count could reach 40 to 50.

Arizona Strip

Energy Fuels Nuclear (EF) and Pathfinder Mines were the only producers conducting work in the Arizona Strip. EF discontinued mining at its Kanab North site in mid-March, and began a 14-week drilling program on the north edge of the canyon in May. Pathfinder's activity in the strip involved one exploratory drilling rig north of the canyon.

Nebraska

Ferret Exploration of Nebraska (FEN) operated several development rigs at its Crow Butte site. Production began this spring and has been progressing according to plan. FEN continues to improve its wellfield balance as it moves toward full commercial operation. Ferret Exploration (the parent company of FEN) also conducted some further exploratory drilling at some of its sites in Nebraska and Colorado.

Texas

Another significant development was the recent announcement by Total Minerals/Malapai Resources that it intended to restart in-situ leaching (ISL) operations at El Mesquite, Texas as of August 1. The El Mesquite mine is located approximately 100 miles west of Corpus Christi and

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contains about 3 million pounds of recoverable reserves at an average grade of 0.10% U_3O_8. Total Minerals also continued exploratory drilling at its Alta Mesa site.

Wyoming

Total/Malapai also announced that it would resume ISL production at its Christensen Ranch property as soon as it verifies that all mine systems are operating properly. The site, located in the northern Powder River Basin, contains 17.6 million pounds of recoverable reserves at an average grade of 0.116% U_3O_8.

In other areas of Wyoming, some exploratory work occurred at the Green Mountain site, under the joint venture between US Energy Corporation and Kennecott Corporation. Earlier this year, Uranerz, USA sold all of its Wyoming uranium properties to Pathfinder Mines, including the Ruth and North Butte projects. Pathfinder has indicated that assessment drilling will begin later this year.

Canada

Limited drilling activity is underway in Saskatchewan, primarily due to seasonal restrictions. Interuranium Canada Ltd. conducted some exploratory drilling early in the year in the Athabasca Basin, and has indicated it will resume drilling during the winter of 1992. Elsewhere in the Athabasca Basin, Cameco did some drilling at Rabbit Lake and also has been conducting further exploratory drilling at its recently discovered McArthur River site. Partners in the McArthur River Joint Venture are Cameco (43.991%), Uranerz Exploration and Mining Ltd. (29.444%), Agip Resources Ltd. (10.0%), Interuranium Canada Ltd. (9.063%), Cogema Canada Ltd. (6.502%), and Imperial Metals Corp. (1.0%).

Cameco also conducted an initial public stock offering in late June, as it begins to privatize. Underwriters issuing the 10.4 million treasury shares at C$12.50 per share received firm orders for the entire quantity by the close of the first business day after the offering was announced. Cameco will receive C$130 million, less underwriting fees, and give the public a 20-percent share of the company; the province of Saskatchewan and the Canadian government own the balance of the company. Future stock offerings are planned as the company intends to become almost entirely privately owned.

CONCLUSION

With market conditions and excess inventories continuing to be the most important influence on the market, uranium exploration and development will maintain merely a subsistence level of activity. With such limited activity, the major factors affecting the exploration industry will be consolidations and company reorganizations. But with each passing month, inventories grow smaller and the need for new resources increases. Consequently, the exploration and development branch of the uranium industry must simply wait until it can again be a vital and growing portion of the industry.

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NUCLEAR INDUSTRY CALENDAR

1991

Sept. 2-6	***International Conference on the Safety of Nuclear Power: Strategy for the Future*** (Vienna, Austria). Contact: IAEA Conference Service Station; 43-1-2360; Fax: 43-1-234564; or mail: PO Box 100, A-1400 Vienna, Austria.
Sept. 4-6	***Uranium Institute Sixteenth Annual Symposium*** (London, UK). Contact: Uranium Institute; 44-71-225-0303; or Fax: 44-71-225-0308.
Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29- Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Oct. 24	***Canadian Participation in World Fusion: Opportunities and Challenges*** (Skyline Hotel, Ottawa, Canada). Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society. Contact: Sylvie Caron, CNA; 416-977-6152; Fax: 416-979-8356; or mail: 144 Front St., Suite 725, Toronto, Ontario, Canada M5J 2L7.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES; 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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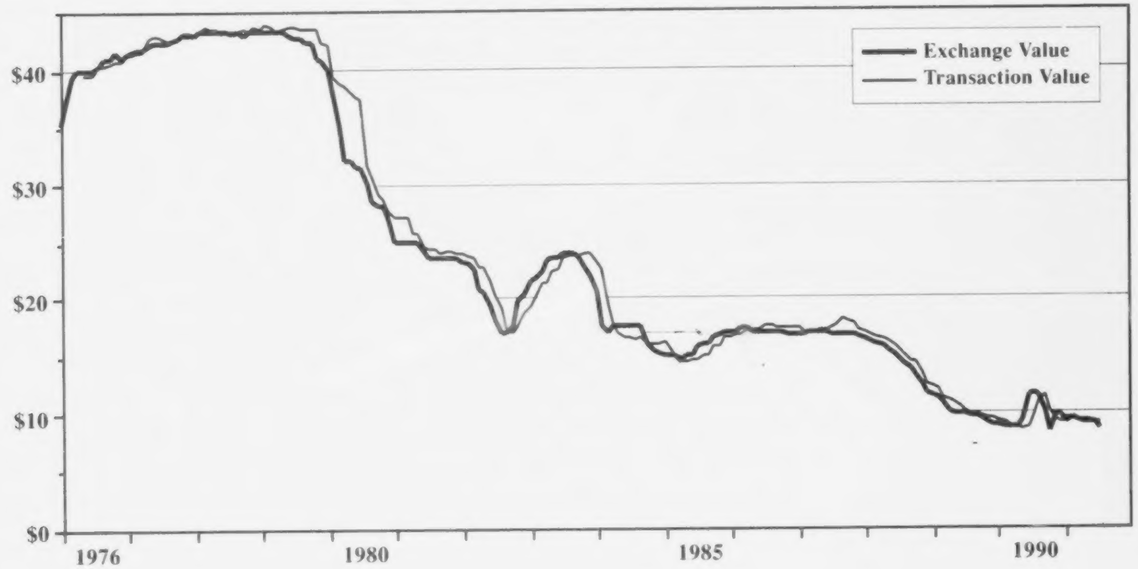
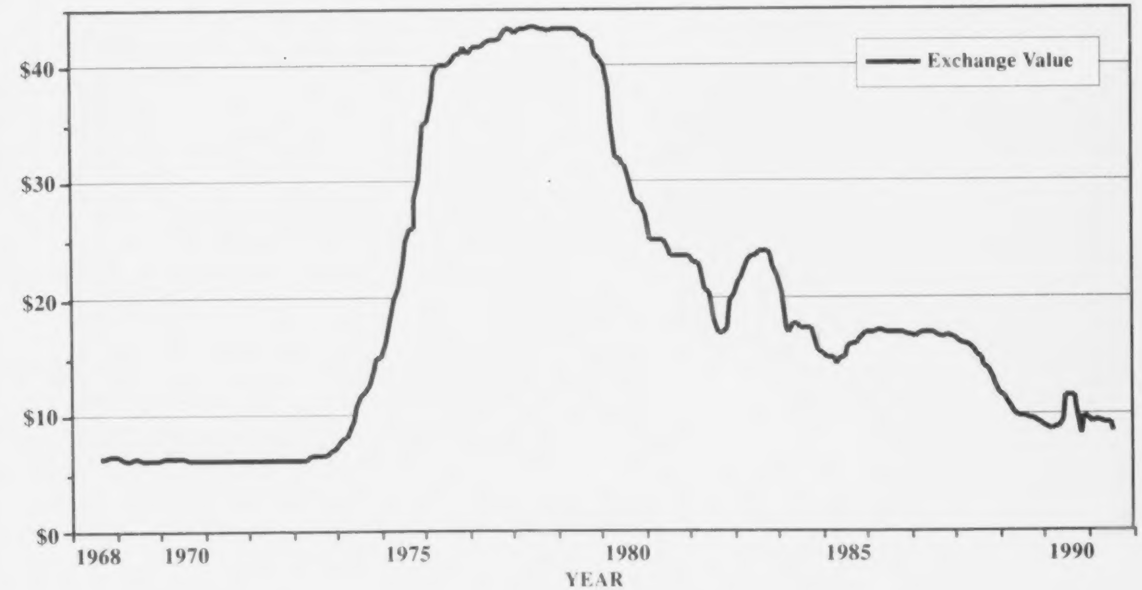
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	**8.55**					

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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UF₆ Values

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	**25.75**					

US Premium (Relative to the UF₆ Value)

Determined as of the last day of the month indicated ($US/kg U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF₆)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	**1.50**					

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	**9.15**					

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	**66**					

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**					

* Float with Prime Rate

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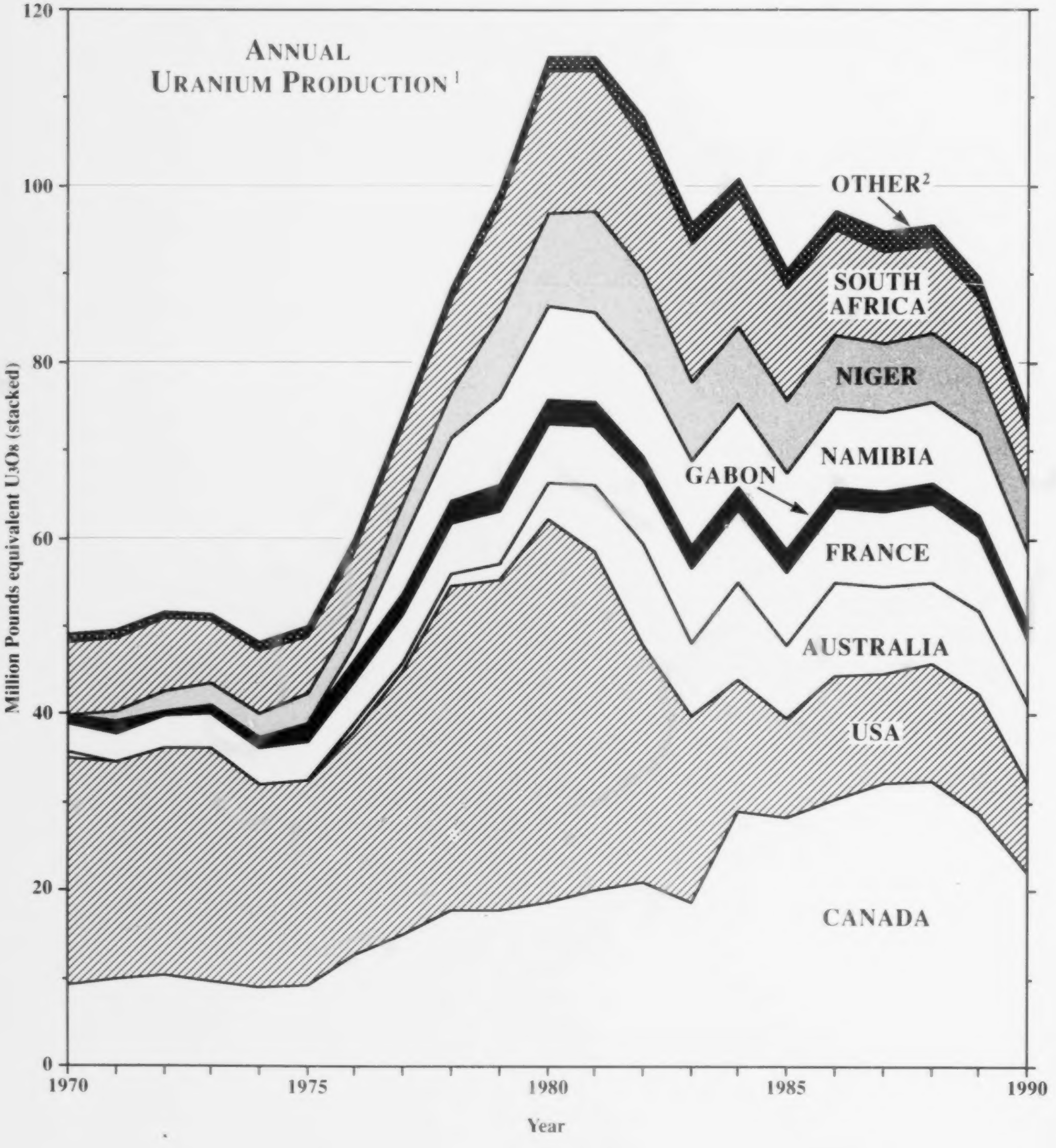

ANNUAL URANIUM PRODUCTION [1]

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[1] Estimated world uranium production in 1990 totalled 85.2 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 - France: 7.4 - Gabon: 1.8 – Namibia: 8.0 - Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] Other includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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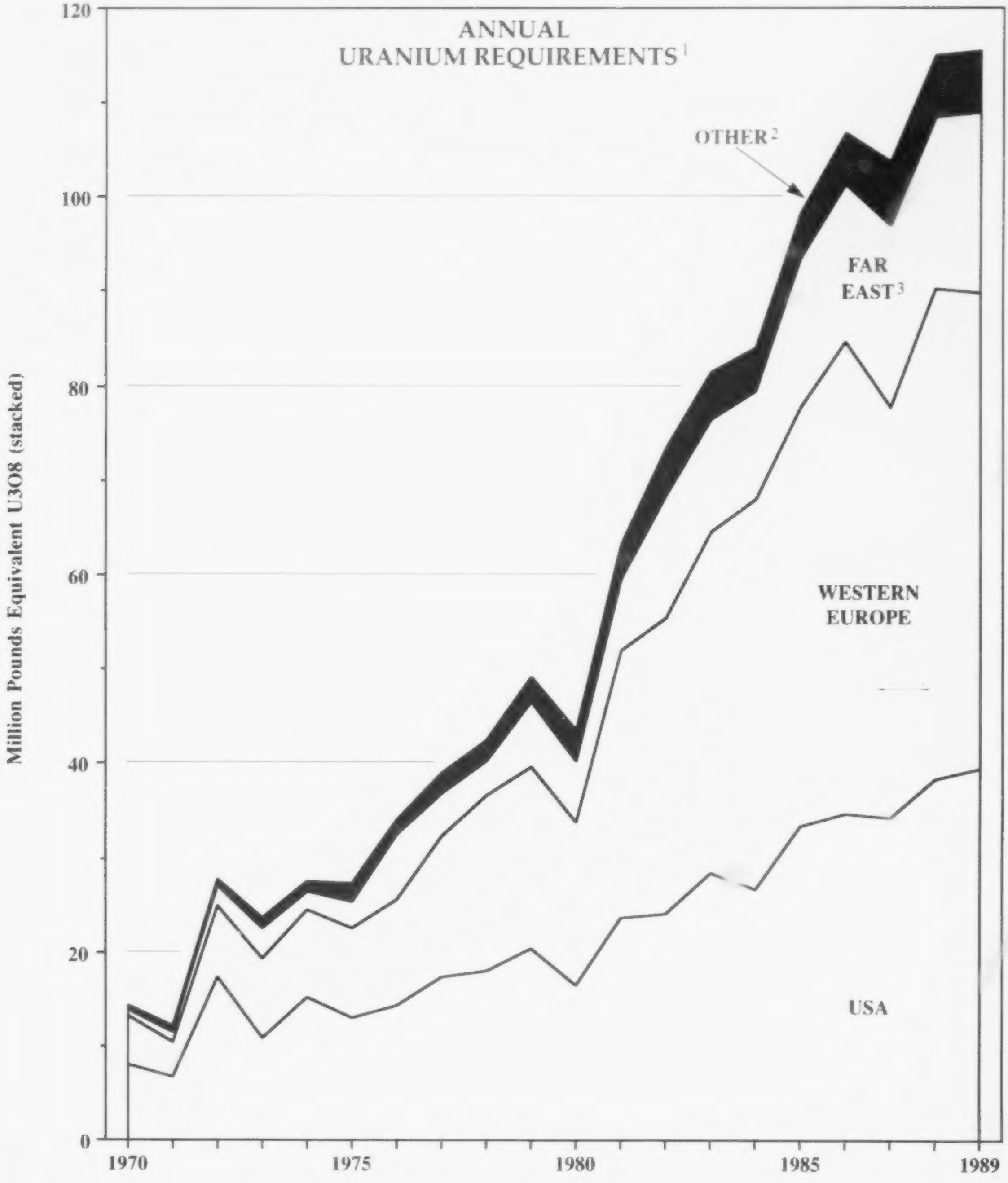

[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	140.8[6]
1981	Avg.	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0**R**
Sept	1990	208.9	128.2	—	130.2**R**
Oct	1990	—	134.1	—	130.4
Nov	1990	—	133.7	589.20	130.4
Dec	1990	214.5	128.8	—	130.6
Jan	1991	—	125.6	—	130.6
Feb	1991	—	121.5	—	130.5
Mar	1991	214.1	119.1	—	130.6
Apr	1991	—	117.6	—	130.8**R**
May	1991	—	117.8	—	130.8

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

[6] Base: June 1976 = 100.

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GOVERNMENT STATISTICS

Canada

				Wage-earner Data: Average Hourly Earnings (C$)[4]				
		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	**Consumer Price Index: All Items (1986 = 100)[3]**	**Uranium Mines (SIC 057)**	**Metal Mines (SIC 051-059)**	**Mines, Quarries and Oil Wells (SIC 051-099)**	**Metal Rolling, Casting and Extruding (SIC 298)**	**Chemicals and Chemical Products Industries (SIC 372-379)**
1980	Avg.	75.7	67.1	--.--	--.--	--.--	--.--	--.--
1981	Avg.	83.4	75.5	--.--	--.--	--.--	--.--	--.--
1982	Avg.	89.0	83.7	--.--	--.--	--.--	--.--	--.--
1983	Avg.	92.1	88.5	17.22	--.--	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	--.--	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7 **R**	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0 **R**	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.5	125.0	25.23	22.45	20.13	14.63	16.19
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1 **R**	125.5	24.77 **R**	22.50 **R**	20.31 **R**	14.63 **R**	16.64 **R**
May	1991	108.8 **R**	126.1	24.43 **P**	22.20 **P**	20.30 **P**	14.66 **P**	16.63 **P**
June	1991	108.6	126.7	--.--	--.--	--.--	--.--	--.--

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011; Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	[illegible]	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	660,151	942,831
Jan	1991	—	—	219.5	218.0	648,944	935,839
Feb	1991	—	—	222.2	219.3	650,948	893,373
Mar	1991	137.66	323.82	224.1	218.5	640,039	905,490
Apr	1991	—	—	227.3	220.9	—	—
May	1991	—	—	230.8	221.9	—	—
June	1991	—	—	232.4	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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United States

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	**All Commodities (1982 = 100)**			**Metal Mining (SIC 10)**	**Primary Non-ferrous Metals (SIC 333)**	**Chemicals and Allied Products (SIC 28)**	**Electric and Electronic Equipment (SIC 36)**
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.5	116.0	135.2	—	14.85 **R**	14.56 **R**	13.96 **R**	10.63
May	1991	116.1	116.5	135.6	—	14.79 **P**	14.54 **P**	14.02 **R**	10.65 **R**
June	1991	116.0	116.3	136.0	136.1	—.—	—.—	14.10 **P**	10.73 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price in ECU per pound U_3O_8	Medium or Long-Term Contracts[3] Average Price in US Dollars per pound U_3O_8	Spot Contracts[3] Average Price in ECU per pound U_3O_8	Spot Contracts[3] Average Price in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] ($/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1

P = Preliminary   **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1989: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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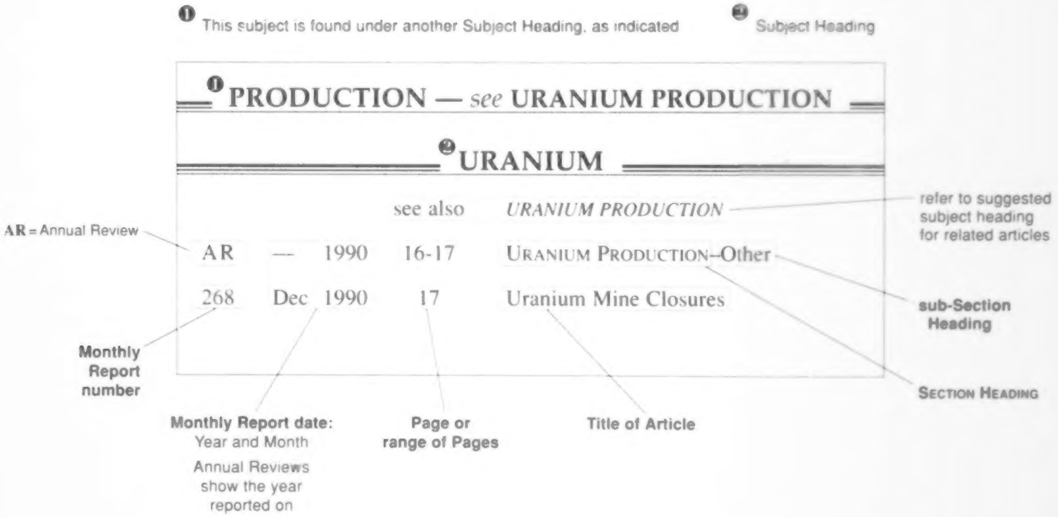
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270	Feb 1991	16	Czech VVER's to Remain in Operation
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267	Nov 1990	27-31	Pribram Uranium District
266	Oct 1990	24	Czechoslovakia Joins Foratom
265	Sept 1990	29-39	Czechoslovakia's Nuclear Power and Fuel Programs
262	June 1990	19	Czechoslovakia Delays Temelin 1 and 2
258	Feb 1990	19	Temelin Construction Suspended
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263	July 1990	22-27	World Uranium Requirements 1990-2005
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
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272	Apr 1991	20	Denison Temporarily Suspends Elliot Lake Operations
270	Feb 1991	15	Denison Seeking Partner to Cure Financial Problems
AR	— 1990	18-19	EXPLORATION AND DEVELOPMENT—Canada
260	Apr 1990	19	Denison Announces Cuts in Elliot Lake Production

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264	Aug 1990	14-15	EdF Subsidiary To Purchase Malapai
263	July 1990	19	Chinon A3 Shut Down
262	June 1990	20	EdF Seeks Approval to Build Seven New Plants
261	May 1990	17	SAE Acquires Malapai

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270	Feb 1991	17-21	When Will Nuclear Power Return?
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266	Oct 1990	13-15	Consolidation of German Electric Utilities
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265	Sept 1990	16	East Germany Utility Takeover Settled
265	Sept 1990	17-25	Electrical Energy Alternatives and Their Effect on the Environment
264	Aug 1990	13	National Energy Strategy Update
264	Aug 1990	20	W. Germany Utilities to Take Over E. German Utilities
261	May 1990	17	Swedish Nuclear Phase-Out Delay More Likely

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272	Apr 1991	21	JAERI Breaks Ground on High Temperature Test Reactor
272	Apr 1991	21	Swiss Government Supports Increase in Nuclear Plant Capacities
271	Mar 1991	12	Mihama 2 Incident
271	Mar 1991	13	US National Energy Strategy
271	Mar 1991	16	China Releases New Information on Nuclear Plans
271	Mar 1991	17	India Marketing Nuclear Power Technology
271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
270	Feb 1991	15	Germany's Government Agrees to Revise Atomic Act
270	Feb 1991	16	Czech VVER's to Remain in Operation
270	Feb 1991	16	Japanese Pro-Nuclear Governor Reelected
270	Feb 1991	16	Sweden Agrees on Nuclear Phase-Out Plans
270	Feb 1991	17-21	When Will Nuclear Power Return?
269	Jan 1991	13	International Nuclear Societies Form Council
269	Jan 1991	14-20	Soviet Union's Nuclear Power Program
AR	— 1990	1-112	ANNUAL REVIEW 1990
268	Dec 1990	14-16	Nuclear Energy Forum
268	Dec 1990	16	Next Nuclear Power Plant Order
268	Dec 1990	19	Soviet Union and Argentina to Cooperate in Breeder Program
268	Dec 1990	25-29	United States Energy Outlook: New Challenges, New Directions
267	Nov 1990	13	1990 Report on Atomic Energy
266	Oct 1990	13-15	Consolidation of German Electric Utilities
266	Oct 1990	19-20	Uranium Institute Symposium '90
266	Oct 1990	21-22	USCEA Uranium '90 Conference
265	Sept 1990	13	President's Commission Issues Report
265	Sept 1990	15	Soviets Buy US Computers for Nuclear Safety
262	June 1990	17-18	Nuclear Power Assembly Conference
261	May 1990	16	Nuclear Generated 17% of World Electricity
260	Apr 1990	27-34	South Korea's Nuclear Fuel Industry
257	Jan 1990	13	Revive The Atom—New York Times Editorial
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268	Dec 1990	17	Uranium Mine Closures

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273	May 1991	14	User Fees
272	Apr 1991	15-17	USCEA Fuel Cycle '91 Conference Overview
272	Apr 1991	18	DOE Considers SWU Purchase
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270	Feb	1991	16	Japanese Pro-Nuclear Governor Reelected
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267	Nov	1990	18	Japanese Vapor Laser Achieves 5% Enrichment
266	Oct	1990	3-4	Enrichment Lead Times and Fabricator Flexibility
265	Sept	1990	12	Isotope Technologies Announces New Partners
265	Sept	1990	13-14	DOE Asks Congress to Reconsider Reprogramming Request
264	Aug	1990	18-19	USCEA Nuclear Fuel Supply Committee Meeting
264	Aug	1990	19	Isotope Technologies CRISLA Progress Report
264	Aug	1990	20	Japan Completes Laser Enrichment Test Plant
264	Aug	1990	21	DOE FY91 Incentive Price (IP2) Predicted
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263	July	1990	22-27	World Uranium Requirements 1990-2005
262	June	1990	14	Smith Barney Report Released
262	June	1990	15	Canada Modifies Nuclear Export Policies
262	June	1990	16	DOE Uranium Enrichment Funds Reallocation
262	June	1990	17	DOE Purchase of Soviet SWU Possible
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260	Apr	1990	17	LES Licensing Procedures
259	Mar	1990	27-29	Major Issues Facing Research Reactor Operators
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258	Feb	1990	16	Smith Barney Awarded Business Review Contract
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258	Feb	1990	17	Soviet Enrichment Imports (to USA)
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267	Nov	1990	15	Enrichment Bill on Budget Reconciliation
267	Nov	1990	15	House Uranium Enrichment Restructuring Hearing
267	Nov	1990	17	LES Licensing Amendment
263	July	1990	17	Senate Hearing on Smith Barney Report
262	June	1990	14	Smith Barney Report Released
261	May	1990	14-15	Uranium Enrichment Reorganization Act
261	May	1990	15	DOE Enrichment Program and AVLIS
257	Jan	1990	15	Western Governor's Association Supports Bill
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AR	—	1990	10-15	MARKET DEVELOPMENTS—Enrichment Services

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274	June 1991	15	DOE FY 1992 Budget
274	June 1991	26-32	The Markets For Uranium and Enrichment
273	May 1991	13-14	Uranium Enrichment Restructuring
273	May 1991	15	AVLIS Budget Hearing
270	Feb 1991	13	DOE FY 92 Budget Request
AR	— 1990	12-14	MARKET DEVELOPMENTS—Enrichment Services/US Department of Energy
264	Aug 1990	18-19	USCEA Nuclear Fuel Supply Committee Meeting
264	Aug 1990	20	Japan Completes Laser Enrichment Test Plant
263	July 1990	17-18	Schedule for AVLIS Deployment
262	June 1990	14	Smith Barney Report Released
261	May 1990	15	DOE Enrichment Program and AVLIS
259	Mar 1990	4	Interpretation of the USEC
258	Feb 1990	16	AVLIS (Development Plan Released)
258	Feb 1990	16-17	FY 91 Budget
AR	— 1989	11-14	MARKET DEVELOPMENTS—Enrichment Services

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272	Apr 1991	27-35	Conversion and Enrichment in the Soviet Union
270	Feb 1991	15	LES Files Application for US Enrichment Plant
AR	— 1989	11-14	MARKET DEVELOPMENTS—Enrichment Services

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AR	— 1990	15	MARKET DEVELOPMENTS—Enrichment Services
265	Sept 1990	12	Isotope Technologies Announces New Partners
264	Aug 1990	19	Isotope Technologies CRISLA Progress Report
AR	— 1989	11-14	MARKET DEVELOPMENTS—Enrichment Services

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AR	— 1990	14	MARKET DEVELOPMENTS—Enrichment Services/Eurodif
272	Apr 1991	27-35	Conversion and Enrichment in the Soviet Union
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AR	— 1989	11-14	MARKET DEVELOPMENTS—Enrichment Services

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270	Feb 1991	29-30	1990 Exploration and Development in North America
269	Jan 1991	13	Ontario Hydro Must Give Millions to Opposition
268	Dec 1990	25-29	United States Energy Outlook: New Challenges, New Directions
267	Nov 1990	16	Clean Air Legislation
265	Sept 1990	17-25	Electrical Energy Alternatives and Their Effect on the Environment.
265	Sept 1990	29-39	Czechoslovakia's Nuclear Power and Fuel Programs
264	Aug 1990	13	National Energy Strategy Update

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259	Mar 1990	18	Radionuclide Emission Regulations
258	Feb 1990	15	New Radionuclide Regulations Issued
257	Jan 1990	13	Revive The Atom—New York Times Editorial
257	Jan 1990	14	New Radionuclide Regulations Issued

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269	Jan 1991	22-25	1990 Industry Developments
AR	— 1990	21	Exploration and Development—Europe
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266	Oct 1990	13-15	Consolidation of German Electric Utilities
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AR	— 1989	41	Western Europe—Portugal
252	July 1989	22-30	Uranium Resources: Are They Adequate?
251	June 1989	26-30	Fusion—The Controversy Continues

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257	Jan 1990	15	EC–USSR R&D Agreement

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AR	— 1990	18-23	Exploration and Development
267	Nov 1990	19-26	Taxation and Regulation of Uranium Mining in Canada
267	Nov 1990	27-31	Pribram Uranium District
267	Nov 1990	32-34	Uranium Exploration and Development Update
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
264	Aug 1990	31-32	US Uranium Exploration and Development Update
262	June 1990	19	Cameco Locates Major Deposit at McArthur River
262	June 1990	21-28	Financing Uranium Exploration and Development Projects in the 1990s
260	Apr 1990	19	U.S. Energy and Kennecott Restructure Joint Venture
260	Apr 1990	20	Nova Scotia Extends Uranium Exploration Ban

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273	May 1991	17-22	Soviet Union's Energy Situation
267	Nov 1990	19-26	Taxation and Regulation of Uranium Mining in Canada
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005

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272	Apr 1991	21	German State Issues MOX Plant License
268	Dec 1990	17	B & W and GA Form MHTGR Fuel Joint Venture

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262	June 1990	20	Operating License Issued for Melox Plant
260	Apr 1990	27-34	South Korea's Nuclear Fuel Industry
259	Mar 1990	27-29	Major Issues Facing Research Reactor Operators

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266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
264	Aug 1990	22-26	World Enrichment Services Market 1990-2005
259	Mar 1990	23-26	Technical Analysis in Short-Term Uranium Price Forecasting
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries

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AR	— 1990	16-17	Uranium Production—France
AR	— 1990	52-57	Europe—France
268	Dec 1990	18	CGE Agrees to Relinquish Control of Framatome
266	Oct 1990	24	Cogema's UP3 Facility Operational
266	Oct 1990	24	EdF Confirms Order for Civaux 1
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
263	July 1990	19	Chinon A3 Shut Down
262	June 1990	20	EdF Seeks Approval to Build Seven New Plants
262	June 1990	20	Operating License Issued for Melox Plant
260	Apr 1990	19	Cogema Closes Two Mines, Others to Follow
AR	— 1989	15-16	Uranium Production—France
AR	— 1989	35-39	Western Europe—France

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274	June 1991	16	GA Agrees to Buy Chevron Uranium Properties
268	Dec 1990	17	B & W and GA Form MHTGR Fuel Joint Venture
265	Sept 1990	16	Ebasco and CEGA Each Win Defense Reactor Contract
265	Sept 1990	16	General Atomics Buys Beverley Mine

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267	Nov 1990	27-31	Pribram Uranium District
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272	Apr 1991	20	German Ruling Party Supports PWRs in Eastern Germany
271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
270	Feb 1991	15	Germany's Government Agrees to Revise Atomic Act
270	Feb 1991	16	Germany Closes Down Last Greifswald VVER
270	Feb 1991	22-28	Uranium Industry of Eastern Germany
269	Jan 1991	13	Green Party Loses Seat in German Parliament
AR	— 1990	58-62	EUROPE—Germany
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265	Sept 1990	16	East Germany Utility Takeover Settled
264	Aug 1990	20	Cogema Signs Reprocessing Contracts for 15 West German Reactors
264	Aug 1990	20	W. Germany Utilities to Takeover E. German Utilities
264	Aug 1990	21	West Germany Decommissions Sole Uranium Processing Plant
264	Aug 1990	21	West Germany to Buy Nukem Plant for Plutonium Storage
261	May 1990	17	VEW Signs Reprocessing Contract with BNFL
260	Apr 1990	20	East and West Germany Forming Joint Nuclear Law
259	Mar 1990	19	Greifswald Shut Down
258	Feb 1990	18	Germany's Würgassen Shut Down
258	Feb 1990	19	RWE Reorganized
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AR	— 1989	50-53	WESTERN EUROPE—West Germany

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268	Dec 1990	18	Hungarians Form Nuclear Society
268	Dec 1990	19	Glencar Exploration in Joint Venture with Hungarian Mine
267	Nov 1990	18	USA to Cooperate with Hungary and Czechoslovakia on Nuclear Power
AR	— 1989	28	EASTERN EUROPE—Hungary

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274	June 1991	16	India Selects Site for New Nuclear Station
271	Mar 1991	17	India Marketing Nuclear Power Technology
AR	— 1990	21	EXPLORATION AND DEVELOPMENT—Asia/India
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258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
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270	Feb 1991	16	ABB Forms Italian Consortium
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266	Oct 1990	25	Italian Government Ratifies ENEL Reactor Shutdowns
263	July 1990	19	Italy to Close Last Two Nuclear Units
AR	— 1989	40	WESTERN EUROPE—Italy

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274	June 1991	16	TEPCO Reactor Plans Receive Approval
274	June 1991	26-32	The Markets for Uranium and Enrichment
272	Apr 1991	21	JAERI Breaks Ground on High Temperature Test Reactor
271	Mar 1991	12	Mihama 2 Incident
271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
270	Feb 1991	16	Japanese Pro-Nuclear Governor Reelected
269	Jan 1991	13	PNC Transfers Interest in Midwest Project
AR	— 1990	33-38	ASIA—Japan
268	Dec 1990	17	Namibia Seeks Uranium Sales In Japan
267	Nov 1990	13	1990 Report on Atomic Energy
267	Nov 1990	18	JNFI Completes Construction of Rokkasho Enrichment Plant
267	Nov 1990	18	Japanese Vapor Laser Achieves 5% Enrichment
267	Nov 1990	18	Kashiwazaki Kariwa 2 Begins Commercial Operation
264	Aug 1990	20	Japan Completes Laser Enrichment Test Plant
263	July 1990	19	Japan to Build 40 Nuclear Power Plants
261	May 1990	16	Japan's Socialist Party Supports Nuclear Energy
AR	— 1989	57-61	FAR EAST—Japan

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260	Apr 1990	18	Mill Tailings Lawsuit
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258	Feb 1990	19	DOE Sues Nevada

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268	Dec 1990	20-24	Preliminary 1990 Market Review
257	Jan 1990	16-23	Uranium Loans
AR	— 1989	10	MARKET DEVELOPMENTS—Natural Uranium/Loans

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268	Dec 1990	17	Namibia Seeks Uranium Sales in Japan
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
264	Aug 1990	1415	EdF Subsidiary to Purchase Malapai

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262	June 1990	14	Smith Barney Report Released
260	Apr 1990	20	Olympic Dam's First Sale of Concentrates to USA
260	Apr 1990	21-24	The Long and The Short of It
257	Jan 1990	16-23	Uranium Loans

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264	Aug 1990	20	Mexico Studying Construction of 20 New Nuclear Reactors
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
AR	— 1989	69	LATIN AMERICA—Mexico

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274	June 1991	17-23	Uranium Industry of the People's Republic of China
273	May 1991	16	Cogema to Close LaCrouzille by 1995
273	May 1991	23-29	Jabiluka Uranium Project
272	Apr 1991	22-26	Rossing Uranium Limited
271	Mar 1991	17	Olympic Dam Expansion to Increase Uranium Production
270	Feb 1991	15	ENUSA Begins Construction of Uranium Concentrates Plant
270	Feb 1991	22-28	Uranium Industry of Eastern Germany
269	Jan 1991	22,28-30	1990 Industry Developments
267	Nov 1990	27-31	Pribram Uranium District
265	Sept 1990	33-39	Czechoslovakia's Nuclear Power and Fuel Programs
260	Apr 1990	18	Mill Tailings Lawsuit
259	Mar 1990	20-22	Perestroika and the Mining Industry
258	Feb 1990	20-27	Soviet Uranium Supply Capability
257	Jan 1990	15	Green River Clean-Up

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274	June 1991	16	Spain's New Energy Plan to Continue Nuclear Moratorium
271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
270	Feb 1991	16	Sweden Agrees on Nuclear Phase-Out Plans
269	Jan 1991	20	Soviet Union's Nuclear Power Program
268	Dec 1990	17	All Ontario New Reactor Plans Halted
268	Dec 1990	18	Oregon Voters Keep Trojan Nuclear Plant Open
266	Oct 1990	24	Poland Abandons Zarnowiec
266	Oct 1990	24	Swiss Voters Reject Phase-Out, Approve Construction Moratorium
263	July 1990	19	Italy to Close Last Two Nuclear Units
261	May 1990	17	Swedish Nuclear Phase-Out Delay More Likely
260	Apr 1990	20	Nova Scotia Extends Uranium Exploration Ban
258	Feb 1990	13-14	Nuclear Phaseout Plans Under Review
258	Feb 1990	18	Poland's Zarnowiec Halted

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AR	— 1990	16-17	URANIUM PRODUCTION—Namibia
AR	— 1990	22	EXPLORATION AND DEVELOPMENT—Africa
AR	— 1990	24-25	AFRICA—Namibia

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260	Apr 1990	17	US Lifts Sanctions Against Namibia
260	Apr 1990	19	Namibian Sanctions Lifted by USA and Canada
258	Feb 1990	13	Namibian Independence Date Set
AR	— 1989	15-16	Uranium Production—Namibia
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AR	— 1990	64	Europe—The Netherlands
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272	Apr 1991	20	German Ruling Party Supports PWRs in Eastern Germany
269	Jan 1991	14-20	Soviet Union's Nuclear Power Program
269	Jan 1991	23,25,31	1990 Industry Developments
AR	— 1990	23-112	Annual Review 1990
268	Dec 1990	16	Next Nuclear Power Plant Order
265	Sept 1990	33-39	Czechoslovakia's Nuclear Power and Fuel Programs
262	June 1990	20	NRC To Announce Proposed Rule For Extending Plant Licenses 20 Years
259	Mar 1990	27-29	Major Issues Facing Research Reactor Operators
AR	— 1989	17-94	Annual Review 1989

Planned/Under Construction

274	June 1991	16	India Selects Site for New Nuclear Station
274	June 1991	16	TEPCO Reactor Plans Receive Approval
271	Mar 1991	16	China Releases New Information on Nuclear Plans
271	Mar 1991	16	Bid Request for Nuclear Station in Czechoslovakia
270	Feb 1991	15	KEPCO Adds Plans For 5 Reactors
268	Dec 1990	19	German Loans Revive Atucha 2
266	Oct 1990	24	EdF Confirms Order for Civaux 1
266	Oct 1990	24	Poland Abandons Zarnowiec
265	Sept 1990	16	Ebasco and CEGA Each Win Defense Reactor Contract
264	Aug 1990	20	Mexico Studying Construction of 20 New Nuclear Reactors
264	Aug 1990	21	Atucha 2 May Be Closed or Sold
263	July 1990	19	China to Accelerate Nuclear Power Program
263	July 1990	19	Japan to Build 40 Nuclear Power Plants
262	June 1990	19	Czechoslovakia Delays Temelin 1 and 2
260	Apr 1990	19	Soviet Environmental Study Delays Rostov Startup
260	Apr 1990	19	Soviet Union to Build Iran Nuclear Plant
260	Apr 1990	20	China to Buy 2,000 MWe Soviet Nuclear Plant
258	Feb 1990	18	Poland's Zarnowiec Halted
258	Feb 1990	19	Temelin Construction Suspended
257	Jan 1990	15	Darlington License Denied
257	Jan 1990	15	Ontario Hydro Plans for 10 New Reactors

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NUCLEAR POWER PLANTS – *continued*

Monthly Report Number	Month/Year	Page(s)	***Completed/Operational***
274	June 1991	16	Japan's 41st Reactor Begins Commercial Operation
272	Apr 1991	21	Swiss Government Supports Increase in Nuclear Plant Capacities
271	Mar 1991	12	Mihama 2 Incident
268	Dec 1990	18	Oregon Voters Keep Trojan Nuclear Plant Open
267	Nov 1990	18	Kashiwazaki Kariwa 2 Begins Commercial Operation
267	Nov 1990	18	Soviet Union May Reopen Nuclear Station in Armenia
266	Oct 1990	25	Italian Government Ratifies ENEL Reactor Shutdowns
266	Oct 1990	25	Seabrook Enters Commercial Operation
265	Sept 1990	15	Bechtel, Westinghouse and Consumers Power Form JV to Operate Palisades
263	July 1990	19	Chinon A3 Shut Down
263	July 1990	19	Italy to Close Last Two Nuclear Units
262	June 1990	19	Chernobyl Closure Announced
262	June 1990	20	Swiss Nuclear Utilities Plan to Increase Unit Capacities
261	May 1990	16	Comanche Peak 1 Receives Operating License
259	Mar 1990	17	Seabrook Operation Approved
258	Feb 1990	18	Germany's Würgassen Shut Down
258	Feb 1990	18	Limerick 2 Enters Commercial Operation

NUCLEAR POWER PLANT CANCELLATIONS

Monthly Report Number	Month/Year	Page(s)	
		see also	*MORATORIUMS*
270	Feb 1991	16	Germany Closes Down Last Greifswald VVER
268	Dec 1990	17	All Ontario New Reactor Plans Halted
268	Dec 1990	19	German Loans Revive Atucha 2
266	Oct 1990	24	Poland Abandons Zarnowiec
266	Oct 1990	25	Italian Government Ratifies ENEL Reactor Shutdowns
264	Aug 1990	21	Atucha 2 May Be Closed or Sold
263	July 1990	19	Chinon A3 Shut Down
263	July 1990	19	Italy to Close Last Two Nuclear Units
262	June 1990	19	Chernobyl Closure Announced
262	June 1990	19	Czechoslovakia Delays Temelin 1 and 2
262	June 1990	20	Vandellos 1 Permanently Closed
261	May 1990	17	Swedish Nuclear Phase-Out Delay More Likely
260	Apr 1990	19	Soviet Environmental Study Delays Rostov Startup
259	Mar 1990	19	Greifswald Shut Down
258	Feb 1990	13-14	Nuclear Phaseout Plans Under Review
258	Feb 1990	18	Germany's Würgassen Shut Down
258	Feb 1990	18	Poland's Zarnowiec Halted
258	Feb 1990	19	Temelin Construction Suspended

NUCLEAR POWER PLANT LICENSING

Monthly Report Number	Month/Year	Page(s)	
272	Apr 1991	15-17	USCEA Fuel Cycle '91 Conference Overview
271	Mar 1991	14	FY 92 Budget
268	Dec 1990	16	Next Nuclear Power Plant Order
268	Dec 9D	18	Court Overrules NRC in Licensing and Training Issues
262	June 1990	20	NRC to Announce Proposed Rule for Extending Plant Licenses 20 Years
262	June 1990	20	Swiss Nuclear Utilities Plan to Increase Unit Capacities
261	May 1990	16	Comanche Peak 1 Receives Operating License
261	May 1990	16	Crow Butte Project Receives Permit to Mine
259	Mar 1990	17	Seabrook Operation Approved
257	Jan 1990	15	Darlington License Denied

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NUCLEAR POWER PLANT TYPES

Monthly Report Number	Month/Year	Page(s)	
272	Apr 1991	21	DOE Awards NPR Construction Management Contracts
272	Apr 1991	21	JAERI Breaks Ground on High Temperature Test Reactor
270	Feb 1991	16	ABB Forms Italian Consortium
268	Dec 1990	19	Soviet Union and Argentina to Cooperate in Breeder Program
259	Mar 1990	27-29	Major Issues Facing Research Reactor Operators

NUEXCO MARKET VALUES

261	May 1990	2-3	April Market Review
258	Feb 1990	Insert	Message To Readers and Customers of NUEXCO from Oren L. Benton

ONTARIO HYDRO

273	May 1991	16	Ontario Hydro to Cancel Denison Contract
269	Jan 1991	13	Ontario Hydro Must Give Millions to Opposition
268	Dec 1990	17	All Ontario New Reactor Plans Halted
266	Oct 1990	24	NDP Surprise Victor in Ontario
257	Jan 1990	15	Ontario Hydro Plans for 10 New Reactors

PAKISTAN

AR	— 1990	43	Asia—Pakistan
262	June 1990	19	Pakistan Reopens Baghalchar Uranium Mine
258	Feb 1990	19	Sole Uranium Mine Closed
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
AR	— 1989	66	Far East—Pakistan

PHILIPPINES

271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
AR	— 1990	43	Asia—Philippines
AR	— 1989	66	Far East—Philippines

POLAND

271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
AR	— 1990	64	Europe—Poland
266	Oct 1990	24	Poland Abandons Zarnowiec
258	Feb 1990	18	Poland's Zarnowiec Halted
AR	— 1989	28	Eastern Europe—Poland

PRICING

AR	— 1990	1-15	Market Developments
268	Dec 1990	20-24	Preliminary 1990 Market Review
264	Aug 1990	21	DOE FY91 Incentive Price (IP2) Predicted
263	July 1990	20-21	First Half 1990 Market Review
262	June 1990	21-28	Financing Uranium Exploration and Development Projects in the 1990s
260	Apr 1990	21-24	The Long and The Short of It
259	Mar 1990	23-26	Technical Analysis in Short Term Uranium Price Forecasting
AR	— 1989	1-14	Market Developments

PRODUCTION — *see* URANIUM PRODUCTION

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RADIONUCLIDE EMISSIONS

Monthly Report Number	Month/Year	Page(s)	
267	Nov 1990	16	Clean Air Legislation
262	June 1990	16	Clean Air Act
260	Apr 1990	17	Radionuclide Emission Regulations
259	Mar 1990	18	Radionuclide Emission Regulations
258	Feb 1990	15	New Radionuclide Regulations Issued
257	Jan 1990	14	New Radionuclide Regulations Issued

REPROCESSING

		see also	*FABRICATION*
		see also	*WASTE MANAGEMENT*
270	Feb 1991	16	Japanese Pro-Nuclear Governor Reelected
266	Oct 1990	24	Cogema's UP3 Facility Operational
264	Aug 1990	20	Cogema Signs Reprocessing Contracts for 15 West German Reactors
262	June 1990	29	Electricité de France
261	May 1990	17	VEW Signs Reprocessing Contract with BNFL
259	Mar 1990	27-29	Major Issues Facing Research Reactor Operators

RESOURCES

		see also	*URANIUM PROJECTS*
274	June 1991	17-23	Uranium Industry of the People's Republic of China
273	May 1991	23-29	Jabiluka Uranium Project
271	Mar 1991	17	Queensland Government Opposes Uranium Mining
270	Feb 1991	22-28	Uranium Industry of Eastern Germany
267	Nov 1990	27-31	Pribram Uranium District

RIO ALGOM, LTD.

274	June 1991	16	Rio Algom and URI Agree to Merge
265	Sept 1990	16	Rio Algom Shuts Down Quirke and Panel Early
263	July 1990	19	Rio Algom Buys into Uranium Resources, Inc.
258	Feb 1990	18	Quirke/Panel Mines to Close

SAFEGUARDS

		see also	*AGENCIES*
268	Dec 1990	19	Soviet Union and Argentina to Cooperate on Breeder Program
266	Oct 1990	17-18	NPT Review Conference Ends Without Consensus
265	Sept 1990	15	NPT Conference Opens in Geneva
265	Sept 1990	15	Soviets Buy US Computers for Nuclear Safety
261	May 1990	24-28	International Atomic Energy Agency

SASKATCHEWAN

273	May 1991	12	Canada and Saskatchewan Revise Review Process
268	Dec 1990	17	Minatco Purchases Remainder of Wolly Project
267	Nov 1990	19-26	Taxation and Regulation of Uranium Mining in Canada
264	Aug 1990	20	Saskatchewan Reveals Buyer Percentages
264	Aug 1990	21	Saskatchewan Revises Uranium Royalty System
262	June 1990	19	Cameco Locates Major Deposit at McArthur River
260	Apr 1990	20	Uranerz Buys One-Third of Cameco's Rabbit Lake Operation

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SOLUTION MINING

Monthly Report Number	Month/Year	Page(s)	
269	Jan 1991	13	Taipower to Invest in Reno Creek ISL Project
266	Oct 1990	16	Rosita Project Initiates Production
265	Sept 1990	26-28	The Crow Butte Project Nears Production
264	Aug 1990	31-32	US Uranium Exploration and Development Update

SOUTH AFRICA

2[illegible]	May 1991	16	EC Removes [illegible] Sanctions Against S. Africa
273	May 1991	16	South African 1st Q91 Production Drops
270	Feb 1991	12	1990 South Africa Uranium Production
AR	— 1990	16-17	URANIUM PRODUCTION—South Africa
AR	— 1990	26-28	AFRICA—South Africa
268	Dec 1990	17	Uranium Mine Closures
264	Aug 1990	27-30	South Africa Update
261	May 1990	16	South Africa 1st Quarter Production
259	Mar 1990	18	Sanctions Against South Africa
259	Mar 1990	19	UK Eases South Africa Sanctions
258	Feb 1990	28	Republic of South Africa: Fourth Quarter 1989 Production
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
AR	— 1989	15-16	URANIUM PRODUCTION—South Africa
AR	— 1989	21-23	AFRICA—South Africa

SOUTH KOREA

270	Feb 1991	15	KEPCO Adds Plans for 5 Reactors
AR	— 1990	38-40	ASIA—South Korea
260	Apr 1990	27-34	South Korea's Nuclear Fuel Industry
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
AR	— 1989	62-63	FAR EAST [illegible] Korea

SOVIET UNION (USSR)

274	June 1991	13	GNSS Press Release
274	June 1991	24-25	Soviet Union's Uranium Trade Policy
274	June 1991	26-32	The Markets for Uranium and Enrichment
273	May 1991	16	Soviet Union Gives Up Wismut Ownership
273	May 1991	17-22	Soviet Union's Energy Situation
272	Apr 1991	20	Hungary to Continue to Use Soviet Fuel Cycle Services
272	Apr 1991	27-35	Conversion and Enrichment in the Soviet Union
271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
269	Jan 1991	14-20	Soviet Union's Nuclear Power Program
AR	— 1990	10-15	MARKET DEVELOPMENTS—Enrichment Services
AR	— 1990	66-72	EUROPE—Soviet Union
268	Dec 1990	18	Soviets Invited to Foratom Meeting
268	Dec 1990	19	Soviet Union and Argentina to Cooperate in Breeder Program
267	Nov 1990	18	Soviet Union May Reopen Nuclear Station in Armenia
266	Oct 1990	25	Wismut to Close Mining Operations
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
265	Sept 1990	15	Soviets Buy US Computers for Nuclear Safety
262	June 1990	17	DOE Purchase of Soviet SWU Possible
262	June 1990	19	Chernobyl Closure Announced
260	Apr 1990	19	Soviet Environmental Study Delays Rostov Startup
260	Apr 1990	19	Soviet Union to Build Iran Nuclear Plant
260	Apr 1990	20	China to Buy 2,000 MWe Soviet Nuclear Plant
259	Mar 1990	20-22	Perestroika and the Mining Industry

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SOVIET UNION (USSR) – *continued*

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258	Feb	1990	20-27	Soviet Uranium Supply Capability
258	Feb	1990	17	Soviet Enrichment Imports (to USA)
258	Feb	1990	17	US-Soviet Nuclear Cooperation
257	Jan	1990	15	EC-USSR R&D Agreement
AR	—	1989	11-14	Market Developments—Enrichment Services
AR	—	1989	29-30	Eastern Europe—Soviet Union

SPAIN

Monthly Report Number	Month/Year		Page(s)	
274	June	1991	16	Spain's New Energy Plan to Continue Nuclear Moratorium
271	Mar	1991	18-23	Status Anti-Nuclear Policies Worldwide
270	Feb	1991	15	ENUSA Begins Construction of Uranium Concentrates Plant
AR	—	1990	21	Exploration and Development—Europe
AR	—	1990	73-74	Europe—Spain
262	June	1990	20	Vandellos 1 Permanently Closed
AR	—	1989	41-43	Western Europe—Spain

SPOT MARKET

Monthly Report Number	Month/Year		Page(s)	
			see also	*MARKETING*
			see also	*PRICING*
AR	—	1990	1-15	Market Developments
268	Dec	1990	20-24	Preliminary 1990 Market Review
260	Apr	1990	21-24	The Long and The Short of It
259	Mar	1990	[illegible]	Technical Analysis in Short Term Uranium Price Forecasting
AR	—	1989	1-14	Market Developments

SUPPLY

Monthly Report Number	Month/Year		Page(s)	
274	June	1991	24-25	Soviet Union's Uranium Trade Policy
274	June	1991	26-32	The Markets for Uranium and Enrichment
AR	—	1990	1-15	Market Developments
266	Oct	1990	34-37	Natural Uranium Supply 1990-2005
AR	—	1989	1-14	Market Developments

SWEDEN

Monthly Report Number	Month/Year		Page(s)	
271	Mar	1991	18-23	Status Anti-Nuclear Policies Worldwide
270	Feb	1991	16	ABB Forms Italian Consortium
270	Feb	1991	16	Sweden Agrees on Nuclear Phase-Out Plans
AR	—	1990	75-76	Europe—Sweden
265	Sept	1990	17-25	Electrical Energy Alternatives and Their Effect on the Environment.
261	May	1990	17	Swedish Nuclear Phase-Out Delay More Likely
259	Mar	1990	19	Nuclear Shut Down Costly
258	Feb	1990	13-14	Nuclear Phaseout Plans Under Review
AR	—	1989	44-45	Western Europe—Sweden

SWITZERLAND

Monthly Report Number	Month/Year		Page(s)	
272	Apr	1991	21	Swiss Government Supports Increase in Nuclear Plant Capacities
271	Mar	1991	18-23	Status Anti-Nuclear Policies Worldwide
AR	—	1990	77	Europe—Switzerland
266	Oct	1990	24	Swiss Voters Reject Phase-Out, Approve Construction Moratorium
262	June	1990	20	Swiss Nuclear Utilities Plan To Increase Unit Capacities
259	Mar	1990	19	Parliament Vetoes Two Anti-Nuclear Measures
AR	—	1989	46	Western Europe—Switzerland

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SWU (SEPARATIVE WORK UNITS)

Monthly Report Number	Month/Year	Page(s)	
		see also	*ENRICHMENT*
AR	— 1990	10-15	MARKET DEVELOPMENTS—Enrichment Services
268	Dec 1990	20-24	Preliminary 1990 Market Review
264	Aug 1990	22-26	World Enrichment Services Market 1990-2005
262	June 1990	17	DOE Purchase of Soviet SWU Possible
AR	— 1989	11-14	MARKET DEVELOPMENTS—Enrichment Services

TAIWAN

271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
269	Jan 1991	13	Taipower to Invest in Reno Creek ISL Project
AR	— 1990	41-42	ASIA—Taiwan
258	Feb 1990	29-35	Projected Uranium Requirements of Developing Countries
AR	— 1989	64-65	FAR EAST—Taiwan

TECHSNABEXPORT (TENEX)

274	June 1991	13	GNSS Press Release
272	Apr 1991	27-35	Conversion and Enrichment in the Soviet Union
AR	— 1990	10-15	MARKET DEVELOPMENTS—Enrichment Services
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
259	Mar 1990	20-22	Perestroika and the Mining Industry
AR	— 1989	11-14	MARKET DEVELOPMENTS—Enrichment Services

TRANSACTIONS

AR	— 1990	1-15	MARKET DEVELOPMENTS
268	Dec 1990	20-24	Preliminary 1990 Market Review
257	Jan 1990	16-23	Uranium Loans
AR	— 1989	1-14	MARKET DEVELOPMENTS

UNITED KINGDOM

271	Mar 1991	18-23	Status Anti-Nuclear Policies Worldwide
AR	— 1990	78-81	EUROPE—United Kingdom
265	Sept 1990	15	UK to Sell PowerGen in Public Offering
259	Mar 1990	19	UK Announces "Nuclear Tax"
259	Mar 1990	19	UK Eases South Africa Sanctions
AR	— 1989	47-49	WESTERN EUROPE—United Kingdom

URANIUM

		see also	*URANIUM PRODUCTION* *URANIUM PRODUCTION COSTS* *URANIUM PROJECTS*
274	June 1991	16	GA Agrees o Buy Chevron Uranium Properties
274	June 1991	26-32	The Markets Ffor Uranium and Enrichment
270	Feb 1991	29-30	1990 Exploration & Development in North America
267	Nov 1990	19-26	Taxation and Regulation of Uranium Mining in Canada
264	Aug 1990	21	Saskatchewan Revises Uranium Royalty System
263	July 1990	22-27	World Uranium Requirements 1990-2005
261	May 1990	18-23	The Economic Future of the US Uranium Industry
260	Apr 1990	14	USCEA Fuel Cycle '90 Conference

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		see also	*URANIUM PROJECTS*
262	June 1990	21-28	Financing Uranium Exploration and Development Projects in the 1990s
			Africa
273	May 1991	16	South African 1st Q91 Production Drops
272	Apr 1991	22-26	Rossing Uranium Limited
270	Feb 1991	12	1990 South Africa Uranium Production
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
AR	— 1990	23-28	AFRICA
268	Dec 1990	17	Uranium Mine Closures
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
264	Aug 1990	27-30	South Africa Update
261	May 1990	16	South Africa 1st Quarter Production
258	Feb 1990	28	Republic of South Africa: Fourth Quarter 1989 Production
AR	— 1989	15-16	URANIUM PRODUCTION
			Asia
274	June 1991	17-23	Uranium Industry of the People's Republic of China
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
AR	— 1990	29-43	ASIA
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
262	June 1990	19	Pakistan Reopens Baghalchar Uranium Mine
258	Feb 1990	19	Paskistan's Sole Uranium Mine Closed
AR	— 1989	15-16	URANIUM PRODUCTION
			Australia
273	May 1991	23-29	Jabiluka Uranium Project
272	Apr 1991	13	Minister Recommends Abolishing Three Mine Policy
271	Mar 1991	17	Olympic Dam Expansion to Increase Uranium Production
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
AR	— 1990	44-45	AUSTRALIA
267	Nov 1990	14	Recent Events Suggest Possible Policy Change
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
262	June 1990	21-28	Financing Uranium Exploration and Development Projects in the 1990s
AR	— 1989	15-16	URANIUM PRODUCTION
			Europe
274	June 1991	24-25	Soviet Union's Uranium Trade Policy
273	May 1991	16	Cogema to Close LaCrouzille by 1995
273	May 1991	16	Soviet Union Gives Up Wismut Ownership
272	Apr 1991	20	Hungary to Continue to Use Soviet Fuel Cycle Services
270	Feb 1991	22-28	Uranium Industry of Eastern Germany
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
AR	— 1990	46-82	EUROPE
268	Dec 1990	17	Uranium Mine Closures
268	Dec 1990	19	Glencar Exploration in Joint Venture with Hungarian Mine

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URANIUM PRODUCTION – *continued*

***Europe** – continued*

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267	Nov 1990	27-31	Pribram Uranium District
266	Oct 1990	25	Wismut to Close Mining Operations
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
264	Aug 1990	21	West Germany Decommissions Sole Uranium Processing Plant
260	Apr 1990	19	Cogema Closes Two Mines, Others to Follow
259	Mar 1990	20-22	Perestroika and the Mining Industry
258	Feb 1990	20-27	Soviet Uranium Supply Capability
AR	-- 1989	15-16	URANIUM PRODUCTION

North America

Monthly Report Number	Month/Year	Page(s)	
274	June 1991	16	GA Agrees to Buy Chevron Uranium Properties
274	June 1991	16	Rio Algom and URI Agree to Merge
273	May 1991	16	Ontario Hydro to Cancel Denison Contract
272	Apr 1991	20	Denison Temporarily Suspends Elliot Lake Operations
271	Mar 1991	16	Energy Fuels Announces Joint Venture
270	Feb 1991	15	Denison Seeking Partner To Cure Financial Problems
269	Jan 1991	13	PNC Transfers Interest in Midwest Project
269	Jan 1991	13	Taipower to Invest In Reno Creek ISL Project
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
AR	— 1990	83-107	NORTH AMERICA
268	Dec 1990	17	Minatco Purchases Remainder of Wolly Project
268	Dec 1990	17	Uranium Mine Closures
267	Nov 1990	32-34	Uranium Exploration and Development Update
266	Oct 1990	16	Rosita Project Initiates Production
266	Oct 1990	26-33	The Major Uranium Suppliers of the 1990s
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
265	Sept 1990	15	Cameco Completes Sale of Interest in Rabbit Lake
265	Sept 1990	16	General Atomics Buys Beverley Mine
265	Sept 1990	16	Rio Algom Shuts Down Quirke and Panel Early
265	Sept 1990	26-28	The Crow Butte Project Nears Production
264	Aug 1990	14-15	EdF Subsidiary to Purchase Malapai
264	Aug 1990	20	Saskatchewan Reveals Buyer Percentages
264	Aug 1990	31-32	US Uranium Exploration and Development Update
263	July 1990	19	Rio Algom Buys into Uranium Resources, Inc.
262	June 1990	19	Cameco Locates Major Deposit at McArthur River
262	June 1990	21-28	Financing Uranium Exploration and Development Projects in the 1990s
261	May 1990	16	Crow Butte Project Receives Permit to Mine
261	May 1990	17	Malapai Sale Agreement Reached
261	May 1990	18-23	The Economic Future of the US Uranium Industry
260	Apr 1990	19	Denison Announces Cuts in Elliot Lake Production
260	Apr 1990	19	U. S. Energy and Kennecott Restructure Joint Venture
260	Apr 1990	20	Uranerz Buys One-Third of Cameco's Rabbit Lake Operation
259	Mar 1990	16	1988 US Uranium Industry Viability
258	Feb 1990	18	Mt. Taylor Mining Ceased
258	Feb 1990	18	Quirke/Panel Mines to Close
AR	— 1989	15-16	URANIUM PRODUCTION

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URANIUM PRODUCTION – *continued*

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			South America
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
AR	— 1990	108-112	SOUTH AMERICA
266	Oct 1990	34-37	Natural Uranium Supply 1990-2005
257	Jan 1990	15	Los Gigantes Mill Shut Down
AR	— 1989	15-16	URANIUM PRODUCTION

URANIUM PRODUCTION COSTS

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273	May 1991	23-29	Jabiluka Uranium Project
272	Apr 1991	22-26	Rossing Uranium Limited
267	Nov 1990	19-26	Taxation and Regulation of Uranium Mining in Canada
264	Aug 1990	21	Saskatchewan Revises Uranium Royalty System
262	June 1990	21-28	Financing Uranium Exploration and Development Projects in the 1990s
261	May 1990	18-23	The Economic Future of the US Uranium Industry
260	Apr 1990	19	Cogema Closes Two Mines, Others to Follow

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		see also	*URANIUM PRODUCTION*
274	June 1991	17-23	Uranium Industry of the People's Republic of China
273	May 1991	23-29	Jabiluka Uranium Project
272	Apr 1991	20	Denison Temporarily Suspends Elliot Lake Operations
272	Apr 1991	22-26	Rossing Uranium Limited
271	Mar 1991	17	Olympic Dam Expansion to Increase Uranium Production
270	Feb 1991	22-28	Uranium Industry of Eastern Germany
269	Jan 1991	13	PNC Transfers Interest in Midwest Project
AR	— 1990	16-17	URANIUM PRODUCTION
AR	— 1990	18-22	EXPLORATION AND DEVELOPMENT
267	Nov 1990	27-31	Pribram Uranium District
265	Sept 1990	15	Cameco Completes Sale of Interest in Rabbit Lake
265	Sept 1990	26-28	The Crow Butte Project Nears Production
262	June 1990	19	Cameco Locates Major Deposit at McArthur River
261	May 1990	16	Crow Butte Project Receives Permit to Mine
260	Apr 1990	20	Olympic Dam's First Sale of Concentrates to USA
257	Jan 1990	15	Los Gigantes Mill Shut Down

URANIUM RESOURCES INC. (URI)

Monthly Report Number	Month/Year	Page(s)	
274	June 1991	16	Rio Algom and URI Agree to Merge
AR	— 1990	16	URANIUM PRODUCTION—USA
266	Oct 1990	16	Rosita Project Initiates Production
263	July 1990	19	Rio Algom Buys into Uranium Resources, Inc.

URENCO — *see* ENRICHMENT SUPPLIERS

USA—UNITED STATES OF AMERICA

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274	June 1991	14-15	1991 Nuclear Power Assembly Summary
AR	— 1990	16-17	URANIUM PRODUCTION—USA
AR	— 1990	93-101	NORTH AMERICA—USA
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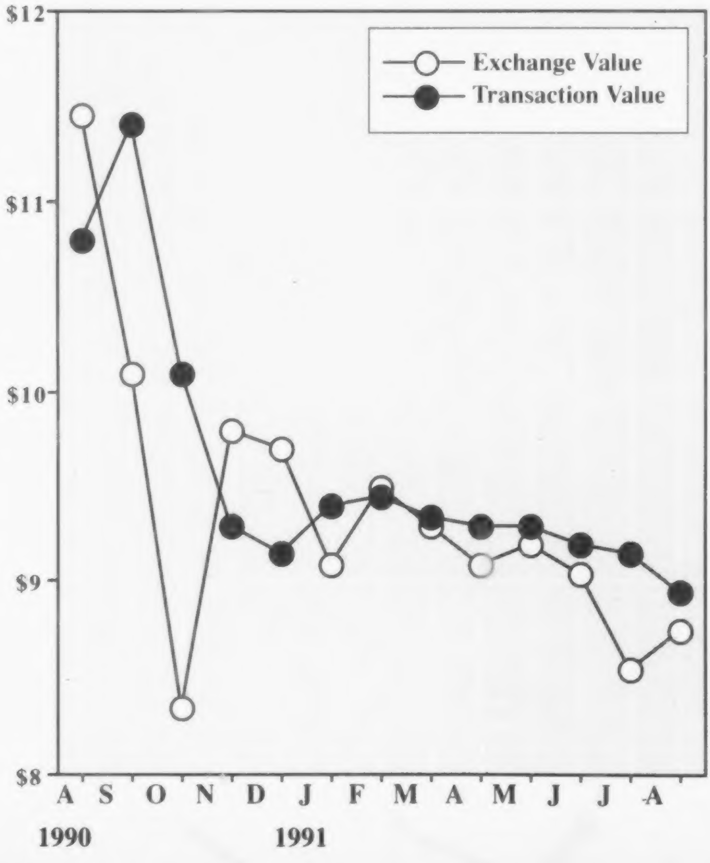

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To Our Readers

NUEXCO will be hosting a hospitality suite at the US Council for Energy Awareness International Uranium Seminar to be held September 22-25 in St. Petersburg, Florida. We look forward to seeing you there.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report August 31, 1991	Last Report July 31, 1991	12 Months Ago August 31, 1990
EXCHANGE VALUE[1]	**\$8.75**/lb equivalent U_3O_8	\$8.55	\$11.45
UF_6 VALUE[2]	**\$26.25** /kg U as UF_6	\$25.75	\$32.25
LOAN RATE[3]	**3.5%** /annum	3.5%	3.5%
CONVERSION VALUE[4]	**\$1.60**/lb U as UF_6	\$1.50	\$1.45
SWU VALUE[5] (0.3 w/o tails assay)	**\$67**/SWU	\$66	\$50
TRANSACTION VALUE[6]	**\$8.95**/lb equivalent U_3O_8	\$9.15	\$10.80
Transactions	**26**	21	27
Months	**3**	3	3
Millions of Pounds	**5.9**	4.1	5.5

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Value** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US\$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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AUGUST MARKET REVIEW

(as of August 31, 1991)

OVERVIEW

Uranium prices at the end of August were slightly higher than at the end of July, having increased during the middle of the month and then declined slightly by month end. The Exchange Value increased $0.20, to $8.75 per pound U_3O_8, while the UF_6 Value increased $0.50, to $26.25 per kgU as UF_6. The emergence of discretionary demand led to the price rise during the middle of the month; abundant supply, reduced demand, and the realization by market participants of the minimal effects of the coup attempt in the Soviet Union caused subsequent price softening later in August.

Unusual for this time of year, the market was quite active in August, with near-term uranium volume exceeding 2.8 million pounds equivalent U_3O_8 in 13 transactions (**Table 1**), and long-term volume reaching almost ten million pounds in nine transactions.

The conversion market strengthened and the Conversion Value increased $0.10 to $1.60 per pound U as UF_6, with at least two utilities evaluating near-term offers, and two long-term transactions reported. The Loan Rate remained unchanged at 3.5 percent per annum. One loan was reported for a moderate quantity of concentrates.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	August 1991		Year-to-Date	
	No. of Sales	Volume	No. of Sales	Volume[1]
Concentrates	10	2.2	51	11.0
Natural UF_6	3	0.6	17	5.2
EUP	0	0.0	8	1.5
Total[2]	**13**	**2.8**	**76**	**17.7**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

The enrichment market saw firmer prices during August, as the SWU Value rose one dollar to $67 per SWU. This is a modest increase compared to the significant price rise of the past few months, and could suggest a stabilizing of the SWU market. Four near-term transactions totalling almost 750 thousand SWU and four long-term sales for almost 700 thousand SWU were reported during August.

NATURAL URANIUM AND CONVERSION

The August 31, 1991 **Exchange Value** rose $0.20 to **$8.75** per pound U_3O_8. Low uranium prices early in the month enticed numerous discretionary buyers, including several producers, into the market. This discretionary demand caused prices to approach the $9.00 per pound level temporarily. Although this price rise coincided with the coup attempt in the Soviet Union, the effect of those events on the market proved to be minimal. By month end, the market had calmed and prices settled back to levels closer to the August 31 Exchange Value. The uranium market is once again characterized by several aggressive sellers and limited demand, as it was at the first of the month.

Ten near-term concentrates transactions totalling over 2.2 million pounds equivalent U_3O_8 were reported. Sellers were predominately intermediaries, while all ten buyers were North American, including five utilities, four producers, and one intermediary.

* * *

The **UF_6 Value** climbed $0.50 to **$26.25** per kgU as UF_6. While supply of UF_6 is not as abundant as that of concentrates, demand for UF_6 is very low. Although the slight strengthening of the UF_6 market follows that of the concentrates market, UF_6 now is selling at a discount of $0.14 compared to the sum of the values of its components—concentrates and conversion.

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Three natural UF_6 transactions were reported from August: US and European buyers purchased almost 600 thousand pounds equivalent U_3O_8 from US intermediaries. No enriched uranium product sales were reported.

* * *

The long-term uranium market was quite active in August: eight utilities and one intermediary purchased nearly 10 million pounds equivalent U_3O_8 for delivery during the period 1991-2000. This exceptionally high level of long-term activity occurred independently of the recent events in the Soviet Union, as most buyers had selected their suppliers before those events unfolded. The effects of the political developments on the long-term market are not yet evident. As a result of the failed takeover attempt by Communist hard-liners, the Soviet reform movement gained new strength, and is furthering the move toward a market-based economy. In the long run, these democratic reforms are likely to improve the economic stability of the Soviet Union, and thereby enhance the stability of the global uranium market.

* * *

The **Transaction Value** dropped \$0.20 to **\$8.95** per pound U_3O_8 based on 26 transactions over three months involving 5.9 million pounds equivalent U_3O_8. August's high volume and lower prices were the primary contributor to the decline.

* * *

Active uranium supply increased by 600 thousand pounds, to **6.6** million pounds equivalent U_3O_8. **Active uranium demand** ended the month at levels up approximately 350 thousand pounds, at **1.2** million pounds equivalent U_3O_8. Although discretionary demand surged early in the month, it was filled as it entered the market, thus reducing overall demand to lower levels by month end. The **supply/demand ratio** dropped from 7.1 to **5.5**.

The **Loan Rate** remained unchanged at **3.5** percent per annum. One loan was reported in which an intermediary borrowed a moderate quantity of concentrates from a producer.

* * *

The conversion market strengthened during August, and the **Conversion Value** rose \$0.10 to **\$1.60** per pound U as UF_6. This is the first change in the Conversion Value in three months. The apparent lack of UF_6 held by parties other than primary suppliers has caused a gradual strengthening of this market. No near-term conversion transactions were reported, although at least two utilities were evaluating offers at month end at levels near the August 31 Conversion Value. Two long-term conversion sales were reported in August: primary converters sold over 3.5 million pounds U as UF_6 to US utilities for delivery during the period 1992-1996.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	6,630	1,213
• Supply/Demand Ratio:	5.5	
• Loan (thousand lbs equivalent U_3O_8)	4,290	0
• Conversion (thousand lbs U as UF_6)	2,350	1,020
• SWU (thousand SWUs)	300	570

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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ENRICHMENT SERVICES

The SWU market began to stabilize after several months of significant prices increases; the **SWU Value** rose one dollar to **$67** per SWU. The near- and long-term SWU markets remain very distinct, although each displayed notable activity during the month.

Four near-term enrichment sales were reported, as both US and European utilities purchased a total of nearly 750 thousand SWU. Activity in the near-term SWU market remains sporadic, as much of the the near-term demand consists of discretionary buyers seeking small quantities of SWU.

The most consistent demand for SWU occurs in the long-term market. At least 11 utilities continued to evaluate offers at month end for up to 10.7 million SWU for delivery through 2002. This is in addition to the four long-term sales reported in August, in which utilities purchased almost 700 thousand SWU from primary producers for delivery during 1995-1998.

Table 3
ENRICHMENT PRICES
(August 31, 1991)

Prices	This Month Report 277	Last Month Report 276	12 Months Ago Report 265
NUEXCO SWU Value ($US per SWU)	67	66	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[2]	153.00[2]	153.00[2]
Requirements	157.00[2]	157.00[2]	157.00[2]
Incentive Price (IP2)[3]	100.68[3]	100.68[3]	90.00[4]
Calculated worth of enriched UF_6[5]**:** ($US per KgU as UF_6)			
2.0 $^{w}/_{o}$ U^{235}	223	218	222
2.5 $^{w}/_{o}$ U^{235}	311	305	304
3.0 $^{w}/_{o}$ U^{235}	403	395	389
3.5 $^{w}/_{o}$ U^{235}	496	486	475
4.0 $^{w}/_{o}$ U^{235}	591	579	562
4.5 $^{w}/_{o}$ U^{235}	687	673	650

[1] Effective 10/1/89 to 9/30/91.

[2] Effective since 10/1/84.

[3] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.

[4] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.

[5] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 $^{w}/_{o}$ U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5188	1991-1995	1,001-3,000	**R**	Intermediary	Producer	UF_6
5189	1991	50-101	90-97	Utility	Intermediary	
5190	1992	301-600	98-102	Intermediary	Intermediary	UF_6
5191	1992-1996	601-1,000	**R**	Utility	Producer	
5194	1992	101-300	90-97	Intermediary	Intermediary	UF_6
5196	1991	50-100	98-102	Producer	Intermediary	
5197	1991	50-100	90-97	Producer	Intermediary	
5198	1991	101-300	90-97	Utility	Intermediary	
5201	1991	101-300	98-102	Utility	Intermediary	
5202	1991	101-300	98-102	Utility	Intermediary	
5203	1991	301-600	103-110	Producer	Intermediary	
5204	1992	101-300	103-110	Utility	Intermediary	UF_6
5205	1991	101-300	98-102	Intermediary	Producer	
5209	1991	101-300	98-102	Utility	Intermediary	
5211	1991	301-600	103-110	Producer	**R**	
5213	1992-1996	300-600	**R**	Utility	**R**	
5214	1992-1996	300-600	See Remarks	Utility	**R**	Price Related to Market
5216	1993-1997	1,001-3,000	See Remarks	Utility	Intermediary	UF_6, Base Escalated
5217	1993-1997	1,001-3,000	See Remarks	Utility	**R**	Price Related to Market
5221	1992-2000	1,001-3,000	See Remarks	Utility	Producer	Price Related to Market
5222	1992-1995	301-600	See Remarks	Utility	Intermediary	Price Related to Market
5223	1992-1995	301-600	See Remarks	Utility	Intermediary	Series of Fixed Prices

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Loan Rate	Borrower	Lender	Remarks
5206	1991	301-600	Above 110	Intermediary	Producer	

Conversion Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range [2] of Current Conversion Value	Buyer	Seller	Remarks
5219	1992-1996	1,001-3,000	**R**	Utility	Convertor	
5220	1992-1996	1,001-3,000	**R**	Utility	Convertor	

Enrichment Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity [3] (thousand SWU)	Price Within Percentage Range [2] of Current SWU Value [4]	Buyer	Seller	Remarks
5186	1991	301-600	**R**	**R**	Producer	
5187	1995	301-600	**R**	Utility	Producer	
5199	1992	50-100	98-102	Utility	Intermediary	
5207	1997	50-100	**R**	Utility	Producer	
5208	1996-1998	101-300	**R**	Utility	Producer	
5210	1992	Less than 50	98-102	Utility	Intermediary	
5212	1995-1998	50-100	**R**	Utility	Producer	
5218	1992	101-300	90-97	Utility	Intermediary	

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
91-1502	500	—	1991	
91-1503A	1,330	2,670	1991-1993	UF_6e
91-1505	1,500	—	1991	
91-1506	500	—	1991	
91-1507	500	—	1991	
91-1510*	1,300	—	1991	UF_6
TOTAL	**6,630**			
INACTIVE	**6,030**			
AVAILABLE TO LOAN:				
ACTIVE				
91-1084	3,900	—		U_3O_8
91-1151	390	—		U_3O_8
TOTAL	**4,290**			
INACTIVE	**655**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 89-1054A

Active Projects removed since last month: 91-1060, 91-1132, 91-1146, 91-1157, 91-1175, 91-1181

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NUEXCO

SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1183	25	—	1991	
91-1186	340	—	1991	
91-1188A*	705	—	1992	UF_{6e}
91-1201*	100	—	1991	
91-1204*	3	—	1991	UF_6
91-1208A*	20	—	1992	UF_{6e}
91-1213*	20	—	1992	UF_6
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1209*	—	100 per year	1991-1995	U_3O_8/UF_6
91-1141*	—	2,680	1992-1995	U_3O_8
91-1197*	—	2,210	1992-1997	U_3O_8/UF_6
TOTAL	**1,213**			
INACTIVE	**1,305**			

INQUIRIES TO BORROW: *No inquiries to borrow are reported*

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1010A, 91-1165

Active Projects removed since last month: 90-1291, 91-1064, 91-1182

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years [1]	Quantity (Thousand Pounds U as UF6) Beyond 3 Years [1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1202*	1,650	—	1991	
91-1500	300	—	1991	
91-1501	400	—	1991	
TOTAL	**2,350**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1174	660	—	1991-1992	
91-1185	360	—	1991	
91-1170	—	1,100	1992-1996	
TOTAL	**1,020**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
AVAILABLE FOR SALE:				
ACTIVE				
91-1508	100	—	1991	
91-1509	200	—	1992	
90-1500	—	1,000 per year	1991 on	
TOTAL	**300**			
INACTIVE	**1,335**			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1188B*	145	—	1992	UF$_6$e
91-1206*	5	—	1992	UF$_6$e
91-1208B*	2	—	1992	UF$_6$e
91-1210*	400	—	1991-1992	
91-1211*	18	—	1992	
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	UF$_6$e
91-1027	—	55 per year	1996-2000	
91-1094B	—	385 per year	1994-1995	UF$_6$e
91-1105	—	40 per year	1996-2001	
91-1142	—	75 per year	1995-2000	
91-1199*	—	385 per year	1996-2000	
90-1144	—	240	1995-2000	
90-1224B*	—	2,320	1995-2002	UF$_6$e
91-1066	—	320	1995-2000	
91-1131	—	3,660	1995-2001	
91-1136	—	120	1996-2000	
91-1152	—	2,700	1995-2001	
91-1154	—	285	1996-2001	
91-1155	—	450	1996-1999	
91-1160	—	980	1992-1997	
91-1171	—	560	1995-1998	
91-1179	—	245	1992-1994	
TOTAL	**570**			
INACTIVE	**415**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 89-1054B, 91-1010B, 91-1150

Active Projects removed since last month: 91-1014B, 91-1063

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Aug. 31, 1991)**	**Last Month (July 31, 1991)**	**12 Months Ago (Aug. 31, 1990)**	**This Month (Aug. 31, 1991)**	**Last Month (July 31, 1991)**	**12 Months Ago (Aug. 31, 1990)**
Australia (dollar)	11.15	10.98	13.98	29.00	28.53	36.35
Belgium (franc)	314.52	307.00	368.29	817.69	798.14	957.46
Canada (dollar)	9.99	9.84	13.13	25.97	25.58	34.14
EC (ecu)	7.42	7.28	8.68	19.30	18.92	22.56
Finland (markka)	37.11	35.89	42.22	96.47	93.30	109.77
France (franc)	51.90	50.68	60.12	134.93	131.75	156.29
Germany (mark)	15.29	14.90	17.94	39.74	38.75	46.63
Italy (lira)	11,404	11,124	13,294	29,647	28,920	34,561
Japan (yen)	1,197	1,175	1,652	3,112	3,054	4,294
Netherlands (guilder)	17.21	16.80	20.21	44.75	43.69	52.54
So. Africa (comm. rand)	25.14	24.49	29.32	65.37	63.67	76.23
So. Korea (won)	6,407	6,255	8,193	16,657	16,263	21,299
Spain (peseta)	951.29	933.20	1,118	2,473	2,426	2,907
Sweden (krona)	55.45	54.08	65.96	144.16	140.60	171.47
Switzerland (franc)	13.33	13.02	14.83	34.65	33.85	38.56
Taiwan (dollar)	231.18	227.51	308.01	601.01	591.49	800.76
UK (pound)	5.21	5.07	5.97	13.54	13.18	15.52
US (dollar)	8.75	8.55	11.45	22.75	22.23	29.77

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Aug. 31, 1991)**	**Last Month (July 31, 1991)**	**12 Months Ago (Aug. 31, 1990)**	**This Month (Aug. 31, 1991)**	**Last Month (July 31, 1991)**	**12 Months Ago (Aug. 31, 1990)**
Australia (dollar)	11.41	11.75	13.19	29.66	30.54	34.28
Belgium (franc)	321.71	328.55	347.38	836.38	854.15	903.11
Canada (dollar)	10.22	10.53	12.39	26.56	27.38	32.21
EC (ecu)	7.59	7.79	8.18	19.74	20.24	21.28
Finland (markka)	37.96	38.41	39.82	98.68	99.85	103.53
France (franc)	53.09	54.23	56.70	138.02	140.99	147.42
Germany (mark)	15.64	15.95	16.92	40.65	41.46	43.98
Italy (lira)	11,664	11,905	12,539	30,325	30,950	32,599
Japan (yen)	1,224	1,257	1,558	3,183	3,268	4,050
Netherlands (guilder)	17.61	17.98	19.06	45.78	46.75	49.55
So. Africa (comm. rand)	25.72	26.21	27.66	66.86	68.14	71.90
So. Korea (won)	6,553	6,694	6,404	17,037	17,404	16,649
Spain (peseta)	973.04	998.69	1,055	2,530	2,596	2,742
Sweden (krona)	56.72	57.87	62.21	147.45	150.46	161.74
Switzerland (franc)	13.63	13.94	13.99	35.44	36.23	36.37
Taiwan (dollar)	236.46	243.48	240.76	614.74	633.00	625.92
UK (pound)	5.33	5.43	5.63	13.85	14.10	14.64
US (dollar)	8.95	9.15	10.80	23.27	23.79	28.08

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[1] As of May 1991 Report #273; calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF₆ This Month (Aug. 31, 1991)	per lb U as UF₆ Last Month (July 31, 1991)	per lb U as UF₆ 12 Months Ago (Aug. 31, 1990)	per kg U as UF₆ This Month (Aug. 31, 1991)	per kg U as UF₆ Last Month (July 31, 1991)	per kg U as UF₆ 12 Months Ago (Aug. 31, 1990)
Australia (dollar)	2.04	1.93	1.77	4.50	4.25	3.90
Belgium (franc)	57.51	53.86	46.64	126.79	118.74	102.82
Canada (dollar)	1.83	1.73	1.66	4.03	3.81	3.67
EC (ecu)	1.36	1.28	1.10	2.99	2.81	2.42
Finland (markka)	6.79	6.30	5.35	14.96	13.88	11.79
France (franc)	9.49	8.89	7.61	20.92	19.60	16.78
Germany (mark)	2.80	2.61	2.27	6.16	5.76	5.01
Italy (lira)	2,085	1,952	1,684	4,597	4,303	3,711
Japan (yen)	218.88	206.07	209.17	482.54	454.31	461.15
Netherlands (guilder)	3.15	2.95	2.56	6.94	6.50	5.64
So. Africa (comm. rand)	4.60	4.30	3.71	10.14	9.47	8.19
So. Korea (won)	1,172	1,097	1,037	2,583	2,419	2,287
Spain (peseta)	173.95	163.72	141.59	383.50	360.94	312.15
Sweden (krona)	10.14	9.49	8.35	22.35	20.92	18.41
Switzerland (franc)	2.44	2.28	1.88	5.37	5.04	4.14
Taiwan (dollar)	42.27	39.91	39.01	93.19	88.00	85.99
UK (pound)	0.95	0.89	0.76	2.10	1.96	1.67
US (dollar)	1.60	1.50	1.45	3.53	3.31	3.20

SWU Value And UF₆ Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Aug. 31, 1991)	SWU Value at 0.30 w/o Tails Assay Last Month (July 31, 1991)	SWU Value at 0.30 w/o Tails Assay 12 Months Ago (Aug. 31, 1990)	UF₆ Value per kg U as UF₆ This Month (Aug. 31, 1991)	UF₆ Value per kg U as UF₆ Last Month (July 31, 1991)	UF₆ Value per kg U as UF₆ 12 Months Ago (Aug. 31, 1990)
Australia (dollar)	85.40	84.72	61.05	33.46	33.06	39.38
Belgium (franc)	2,408	2,370	1,608	943.57	924.60	1,037
Canada (dollar)	76.49	75.97	57.35	29.97	29.64	36.99
EC (ecu)	56.85	56.17	37.89	22.27	21.91	24.44
Finland (markka)	284.14	277.03	184.37	111.32	108.08	118.92
France (franc)	397.41	391.18	262.52	155.70	152.62	169.33
Germany (mark)	117.05	115.04	78.32	45.86	44.88	50.52
Italy (lira)	87,319	85,870	58,052	34,211	33,502	37,443
Japan (yen)	9,166	9,067	7,213	3,591	3,538	4,652
Netherlands (guilder)	131.81	129.72	88.25	51.64	50.61	56.92
So. Africa (comm. rand)	192.53	189.06	128.04	75.43	73.76	82.59
So. Korea (won)	49,059	48,288	35,776	19,221	18,840	23,075
Spain (peseta)	7,284	7,204	4,882	2,854	2,811	3,149
Sweden (krona)	424.59	417.46	288.02	166.35	162.87	185.77
Switzerland (franc)	102.04	100.52	64.78	39.98	39.22	41.78
Taiwan (dollar)	1,770	1,756	1,345	693.53	685.20	867.54
UK (pound)	39.88	39.13	26.07	15.63	15.27	16.81
US (dollar)	67.00	66.00	50.00	26.25	25.75	32.25

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[1] As of May 1991 Report #273: calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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WASHINGTON FOCUS

by Linda L. Gunter

While official action ceased as most US government employees took summer vacation, several documents of interest to the nuclear fuel industry were issued in Washington during August. In the House of Representatives, the Energy & Power subcommittee staff released a draft uranium enrichment restructuring bill. A General Accounting Office (GAO) report on AVLIS also was published. When Congress returns in September, the Senate has scheduled a hearing on the status of the AVLIS program, and the House Energy & Commerce Committee may hold a hearing about uranium enrichment.

House Staff Draft Enrichment Legislation

The staff of the Energy & Power Subcommittee released for comment new legislation for the restructuring of DOE's enrichment enterprise. The bill proposes DOE keep the gas diffusion plants (GDPs) and the revenue from current contracts, but creates a government corporation responsible for deploying AVLIS and for funding decommissioning and decontamination (D&D) of the GDPs. The D&D fund is expected to collect $500 million per year from both military and civilian customers.

The committee staff clearly intends this draft to be a discussion paper, since much of the organizational structure and operation of the proposed new corporation is not described in detail. Final legislation will come after comments are received from all interested parties. The significant elements of this bill are described below.

The draft legislation authorizes the corporation to sell stock, as well as to enter joint ventures and equity participation agreements. Initially, the US Treasury will purchase $364 million of the corporation's stock to create a working capital fund. Although it is not stated explicitly, the bill's authors may intend that the Treasury continue to retire the unrecovered government costs of at least $3 billion, as is current practice under the DOE-GAO agreement. To satisfy its debt obligations, the corporation will use proceeds from the public sale of stock, net revenue from the operation or sale of the GDPs, and dividends that it would pay on the stock purchased by the Treasury.

The bill states that DOE cannot compete with the AVLIS corporation and requires DOE to purchase SWU from the corporation if it is asked to do so. The corporation is authorized to "acquire or distribute enriched uranium, feed material for uranium enrichment or depleted uranium." Although the staff summary indicates the GDPs will be permitted to operate more "flexibly", there is no language in the bill that expressly authorizes DOE to do so. DOE is to be reimbursed for any future R&D on AVLIS.

The corporation's borrowing authority is not defined, but rather, set at "an amount not exceeding the amount of its capital stock plus retained earnings to assist in financing its activities and to refinance its bonds." These bonds are not guaranteed by the US Government.

The $500 million per year D&D fund does not include D&D money for any AVLIS facilities. Half the D&D fund will come from annual appropriations for the military portion; the other half is raised from the following formula:

- First, from royalties paid for AVLIS.
- Second, from the net proceeds of the sale of the corporation stock.
- Third, from a fee on electricity generated by nuclear power units.

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If the amount from royalties and the sale of stock is not expected to average $250 million over the expected life of the fund, then the utilities are assessed a fee. Deposits continue until DOE certifies to Congress that the fund has enough money to complete D&D of the gaseous diffusion enrichment facilities. Since the total amount necessary to complete D&D of the three plants has not yet been determined, there is concern on behalf of the utilities that creation of this large revenue stream to the Treasury leaves them vulnerable to funding unspecified clean-up of federal facilities. Furthermore, the utilities are concerned that they will not receive cheaper enrichment prices from AVLIS because the formula yields uncompetitive prices.

GAO Report On AVLIS

In early August, the General Accounting Office released a report entitled "DOE Needs Alternative AVLIS Deployment Options", which should provide Congress with justification to continue government funding for the AVLIS R&D program. The report recommends that DOE revise its current deployment plan, since the original schedule, released in January 1990, set a deadline of October 1992 for a deployment decision, a date that is now unrealistic. According to GAO's findings, there are certain technical problems, such as building and maintaining plant-scale lasers and separators, as well as integrating AVLIS into the fuel cycle, that will not be resolved in time for DOE to make its scheduled deployment decision. GAO also notes that the NRC review of AVLIS will take longer than DOE anticipated and will delay the program further. In addition, GAO said an "updated and expanded analysis of the enrichment market is necessary in order to determine the advantages of building an AVLIS plant in a market that already has overcapacity." The report notes that the fate of AVLIS is tied to legislation pending in Congress restructuring DOE's enrichment program. The report calls for DOE to identify other options for AVLIS deployment if the legislation fails, including creating private sector access under the National Competitiveness Technology Transfer Act of 1989. The report also asks DOE to consider alternative methods for encouraging private sector participation in the demonstration program.

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INDUSTRY BRIEFS

India Announces Plans to Increase Nuclear Fuel Production Capability

India's Department of Atomic Energy announced it plans to invest over seven billion rupees ($270 million) in the next decade to build and expand its nuclear fuel production capability. Plans include increasing the UO_2 pellet production capacity at its Hyderabad uranium oxide fuel plant from 350MT per year to 660MT per year; building a uranium fuel assembly plant, also at Hyderabad; and commissioning a 150MT-per-year zircaloy fabrication plant. The department also is planning to build a 300MT-per-year zirconium sponge plant near Palayakayal in Tamil Nadu state.

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Scottish Nuclear to Advise Bulgarian Nuclear Group

Scottish Nuclear Ltd. (SNL) has reached an agreement with the Bulgarian nuclear design and construction group, Energoproject, to provide technical assistance to the group. SNL will supply specialists to advise Energoproject on improving the operation, maintenance, efficiency, and safety of Bulgaria's nuclear reactors. This agreement is in addition to the $13 million assistance program for the Kozloduy station from some western European countries being coordinated by the World Association of Nuclear Operators.

Two Nuclear Reactors Return to Service

On August 21, the 340-MWe (net) Obrigheim reactor in Germany reached full power after being shut down since May 1990. Kernkraftwerk Obrigheim's PWR was forced to shut down due to a legal challenge to its operating license. In June 1991, a federal court overruled a lower court decision and allowed the reactor to restart, stating that the reactor's two partial operating licenses and eight regulatory appendices provided a legal basis for its continued operation.

In the USA, Tennessee Valley Authority's (TVA) Browns Ferry Unit 2 reached full power in mid-August after several months of testing. The 1,065-MWe BWR had been shut down since March 1985 due to safety concerns at all three Browns Ferry units. Since that time, TVA has spent over $1.2 billion for improvements at the site to address safety concerns.

BAG Has No Interest in Share of EdF Plant

Contrary to a previous EdF announcement, the German utility Bayernwerk AG (BAG) has stated that it has no interest in owning a share of Electricité de France's (EdF) Civaux 1 reactor as compensation for Edf's share in the power and distribution system in eastern Germany. BAG does not consider a share of a single reactor enough compensation, despite an earlier EdF announcement that a tentative agreement had been reached. Discussions are ongoing among EdF, BAG, PreussenElektra AG, and RWE Energie AG regarding ownership of eastern Germany's power system.

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Rio Algom-URI Merger Delayed

The announced merger between Rio Algom Mining Corporation and Uranium Resources, Inc. has met an unexpected snag that could postpone the conclusion of the deal. Both sides are still supportive of the merger, but a Canadian tax issue could make the transaction prohibitively expensive for Rio Algom. There are hopes to resolve the issue within the next few weeks.

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SPEECH

INVENTORIES: A BROADER PERSPECTIVE

The following is a paper by Earl E. Hoellen, President of NUEXCO, and Treva E. Klingbiel, Vice-President of NUEXCO Information Services. It was presented by Mr. Hoellen at the Uranium Institute Sixteenth Annual Symposium in London, United Kingdom on September 5, 1991.

INTRODUCTION

During the past ten years, the world uranium industry has undergone a major restructuring. Since 1980, nuclear fuel market participants have noted that a return to a balanced market was dependent on the liquidation of inventories to the point where demand for new production would emerge.

Prior to 1980, many countries accumulated large inventories, both in anticipation of aggressive nuclear power programs and to support military needs. In fact, until 1985 the Western World uranium industry was producing U_3O_8 much faster than it was being consumed by nuclear power plants. However, many nuclear power programs were scaled back or phased out entirely, thus eliminating the need for huge strategic stockpiles. Yet inventories continued to accumulate. **Figure 1** illustrates this buildup of inventory. (These figures represent commercially available inventory only, and exclude government stockpiles.)

During most of the 1970s, the US government was the Western World's only supplier of commercial enrichment services. US DOE, not a risk-taking commercial entity, positioned itself to pass on to the ultimate consumers the cost of leading the Western World in the peaceful use of nuclear power. Thus, US DOE's contracts were a fixed-commitment type that were not readily adjustable by the customer to reflect variations in nuclear power plant operating or construction schedules. Consequently, most uranium supply contracts signed in that period reflected this same lack of flexibility, and as the number of nuclear plant deferrals and cancellations grew, so too did utility-held inventories.

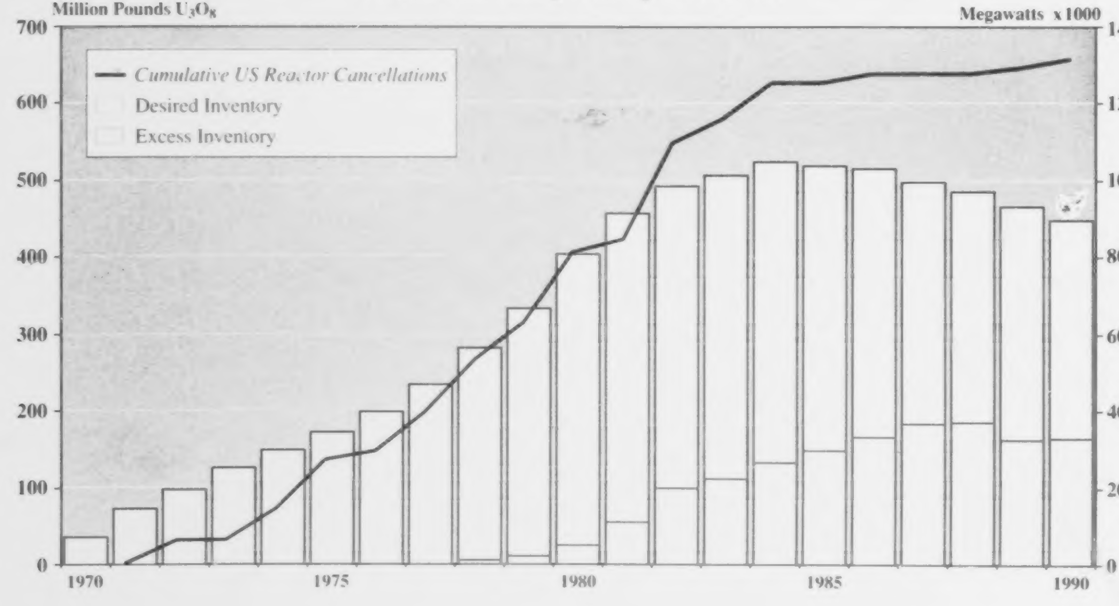

Figure 1
Uranium Inventory Buildup • 1970-1990

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In recent years, with demand far below expectations, with mounting carrying costs, and with many of the concerns over adequacy of supply eliminated due to increasingly international uranium trade, perceptions of the minimum acceptable inventory level have also declined. As a result, inventory holders have reassessed their positions. Economic prudence has dictated a reduction in inventory levels and many inventory holders have chosen to sell or lend their inventories on the spot market, while others have cut back on production or purchases and drawn down their stockpiles.

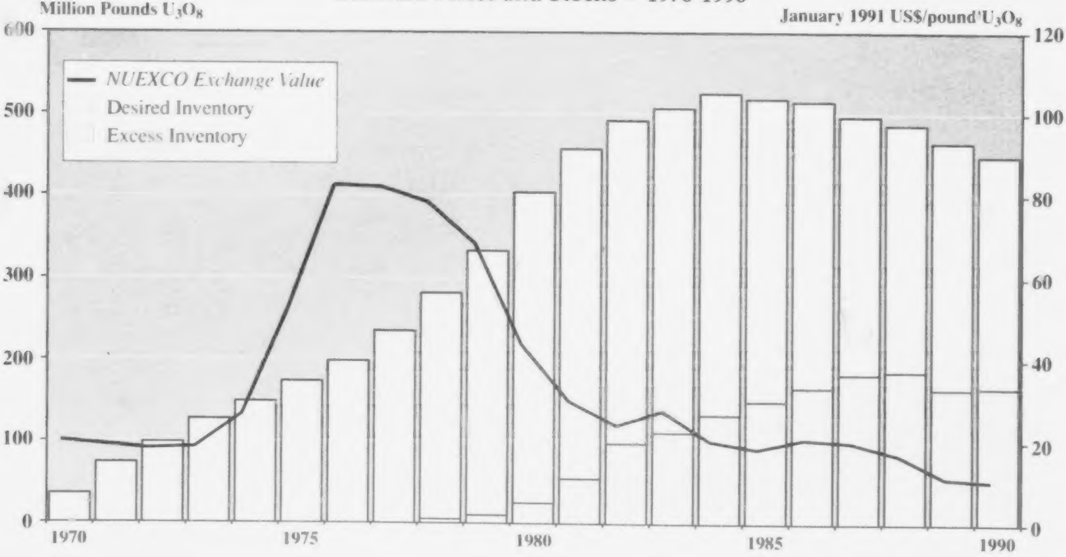
For example, the US DOE, which held over 100 million pounds U_3O_8 (exclusive of defense needs) in 1988, plans to draw down its stockpile to a level of 50 million pounds U_3O_8 primarily through the process of overfeeding at its enrichment facilities. In Italy, large inventories had accumulated in expectation of an aggressive nuclear program that never materialized. The sale of these inventories started several years ago and is only now coming to a close. Germany, which built up a large inventory of uranium to offset a trade imbalance with the US, has been systematically liquidating its inventory since 1989. In almost all cases, these inventory sales have been made at prevailing market prices without consideration for the original production cost or purchase price.

PRICE, POLITICS AND INVENTORY POLICY

This buildup and subsequent liquidation of excess inventory has resulted in a restructuring of the world uranium production industry in ways not anticipated even a few years ago. Whether inventory holders choose to sell, lend, or draw down their stockpiles, the end result is reduced requirements for new production. In fact, annual Western World production has fallen from an all-time high level of about 115 million pounds U_3O_8 in 1980, to 76 million pounds in 1990. Early indications are that 1991 production will be even lower, totalling some 67 million pounds. The accumulation and availability of excess inventories clearly has had a depressing effect on price, as shown in **Figure 2**. Such a relationship between available inventories and price is common in other mineral commodities and is not surprising. Falling prices suggest plentiful supply, which in turn, tends to preclude any perceived need for large inventories.

However, some level of inventory is desired by market participants to mitigate the effects of any supply shortfalls due to accidents, regulatory requirements, labor strikes, or political disruptions; and many entities have inventory

Figure 2
Uranium Prices and Stocks • 1970-1990



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policies which take these factors into account. Such planning is wise, for we all recognize that government intervention in international trade, including the trading of uranium, is commonplace. Examples include the US/Canada Free Trade Agreement, the US Comprehensive Anti-Apartheid Act of 1986, and the Australian Labor Party's Three Mine Policy.

The political realities of laws, sanctions, embargoes, floor prices, and production controls introduce a significant element of additional uncertainty when establishing nuclear fuel inventory policies. The anticipation of possible political intervention can itself become a destabilizing factor in the market, particularly when inflamed by erroneous or suggestive articles or reports. With the political changes in Eastern Europe and the entrance into the market place of China and the Soviet Union, the difficulty of evaluating the political factor and its impact on inventory policy is at an all-time high. This difficulty further complicates the analysis of the world inventory situation.

Until recently, any analysis of the impact of inventories on the market confined itself to inventories held by commercial entities, since government stockpiles were regarded as strategic and highly unlikely ever to enter the marketplace. This assumption was most openly invalidated in 1989 when the German government decided to begin the sale of its stockpile of US origin enriched uranium. With the easing of tensions among the world's superpowers, more governments can be expected to examine the possibility of releasing at least some of their stockpiles into the market and, if done, such inventories will be sold at prices unrelated to their "sunk costs".

A realignment of our thinking is now necessary: analysis of the inventory situation can no longer be confined to the World Outside Centrally Planned Economic Areas (Western World) but must be broadened to include Eastern Europe and China. Not only must we expand our geographical boundaries, but any analysis must now also take into account non-traditional market participants.

CENTRALLY PLANNED ECONOMIES

The cessation of the production of weapons-grade uranium by China and the Soviet Union has led to substantial excess nuclear fuel cycle capacity in both countries. In China, although current goals call for nuclear generating capacity of 6,000 MWe by the year 2000, none of the three units under construction are yet operating. The lack of any existing domestic requirement and the halt of enriched uranium production for military purposes means that China's entire fuel cycle capability is now available for commercial use, if it chooses to make it available. In the Soviet Union, just as in the Western World, the rate of nuclear power growth has not met original expectations. That country's 1985 plan to have 200,000 MWe in operation by 2000 was recently revised to a more realistic 50,000-80,000 MWe by 2005. This, coupled with the cessation of production of all highly enriched weapons-grade uranium in 1987, has led to substantial excess nuclear fuel cycle capacity in the Soviet Union.

Between 1946 and 1990, the Soviet Union's former east European satellites of Bulgaria, Czechoslovakia, East Germany, and Hungary produced nearly one billion pounds U_3O_8 equivalent. The Soviet Union produced approximately 500 million pounds during the same period. Essentially all of the satellites' production was produced under contract to the Soviet Union and was shipped there in return for an eventual supply of fabricated nuclear fuel. As of January 1991, however, the Soviet Union no longer controls the uranium operations of its former satellites, and has not renewed uranium trade agreements with these countries.

The combined east European supply of 1.5 billion pounds U_3O_8 equivalent fell into one of three categories:

- Military use for weapons and fuel.
- Civilian use as a nuclear fuel in both the Soviet Union and its satellites.
- Strategic inventory for fulfillment of possible future requirements (both civilian and military).

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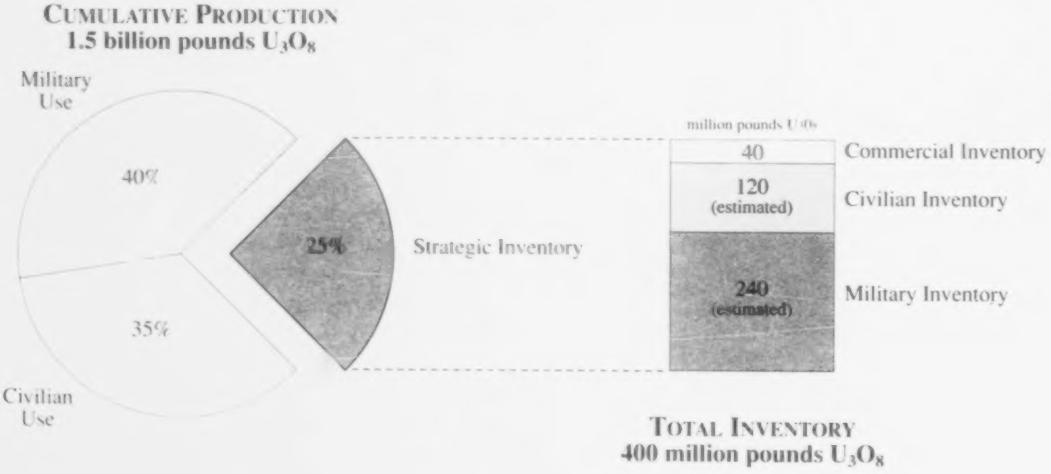
Although detailed figures have not been published by the Soviets, NUEXCO's best estimate is that these three categories account for approximately 40 percent, 35 percent, and 25 percent, respectively, of the total combined supply. Thus, we estimate that some 400 million pounds U_3O_8 equivalent exist in the current Soviet strategic inventory. As shown in **Figure 3**, most of this inventory is believed to be strategic military inventory in the form of highly enriched uranium and is probably not presently available for commercial use. It is estimated that the amount of commercial inventory which could be made available for sale is approximately 15,000 MTU in U_3O_8 (approximately 40 million pounds). The balance of Soviet strategic inventory is viewed as a reserve for domestic power production, and includes some U_3O_8 as well as reprocessed uranium, plutonium, and tails. It is believed that there is no low-enriched uranium inventory except for normal working stock at the enrichment plants.

The Soviet uranium industry, as it exists today, consists chiefly of a series of regional uranium processing facilities that receive ores and concentrates from outlying mines. NUEXCO-affiliated personnel have visited many of these regional facilities that are designed to process other metal ores in addition to uranium, or to produce uranium as a by- or co-product to some other primary product. These "metallurgical complexes", as they are called, are centers of both administration and production, employ a large number of people, and are equivalent to the "company towns" that were common in the US prior to WWII. Regardless of the overall political situation, it is reasonable to assume that the government plans to keep these complexes operating to provide continued employment for the workforce. Independence of various republics within the Soviet Union could increase the pressure for continued production and employment. Ultimately, the market economy that the Soviets are so desperately seeking to establish will set the level of such continued production.

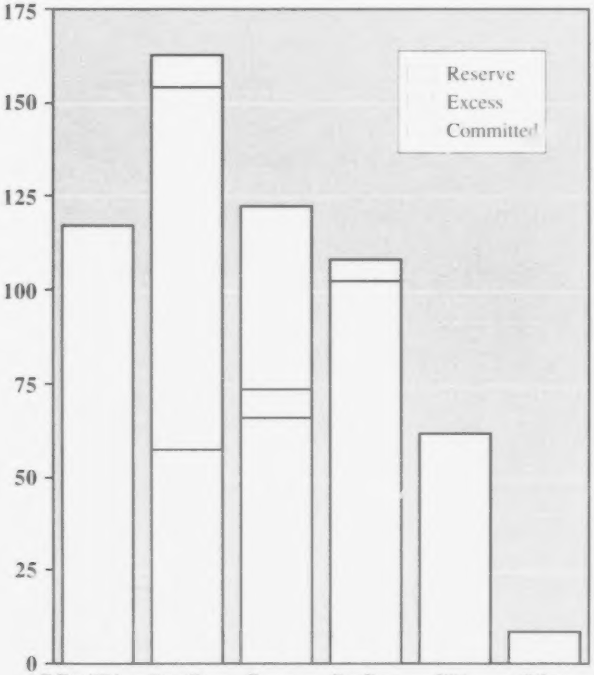
NUEXCO estimates that China has produced a total of approximately 300 million pounds U_3O_8 and is currently producing at about 50 percent of its capability, which is believed to be in the range of 10 million pounds U_3O_8 per year. China has an aggressive plan for building future reactors, but with no reactors having yet reached commercial operation, China has indicated that it can make available for annual export about 3 million pounds equivalent U_3O_8 of its production.

Figure 3
Breakdown of Soviet-Controlled Production and Inventory



In addition, up until the late 1980s, China has pursued an aggressive nuclear fuel production program directed toward its military requirements and is now estimated to have a substantial stockpile. About 30,000 MTU as U_3O_8 (78 million pounds) of China's inventory is designated as commercial. The Chinese uranium industry is well-developed. Over 300 thousand people are employed by the China National Nuclear Corporation with over 60 thousand employed by the Bureau of Geology branch alone. China does have a large inventory and, like commercial enterprises in the Western World, must reevaluate its options under a new world view. They, too, would prefer to sell material from actual production in order to provide continued employment for their workforce but, like all producers, must choose between holding their material from the market or competing at lower prices.

Figure 4
Worldwide Uranium Inventories
(as of January 1, 1991)



CONCLUSION

Many factors, some tangible and others psychological or subjective, affect the uranium market. The elimination of barriers between the East and West is one of these factors.

How does this alter our previous expectations for the return to a balanced market? The sale of excess inventories by all participants in the industry will continue, whether they be commercial entities or governments. The one thing that is certain is that the uranium will not be put back into the ground. This inventory redistribution must, and will, continue until the market reaches equilibrium, or until perceptions of minimum acceptable inventory levels change.

Only after inventory redistribution has run its course will users, out of necessity, turn to normal sources of supply, thereby stimulating additional production to meet needs.

The extent to which producers are willing and able to return to the market is a function of when this new supply gap develops. Some producers with partially loaded facilities can respond quickly by increasing production, but not in large quantities. Those with closed facilities can expect increasing difficulties in restarting, as existing facilities deteriorate, technology advances, and regulations change. Success by producers in managing these challenges will depend partially upon stimulation of higher prices and the extent and duration of the resultant price rise.

Although the Soviets and the Chinese have inventory that is designated as "commercial", it remains to be seen whether it will enter the commercial market. The recognized need for hard currency must be balanced with the need for achieving reasonable prices. Some of the inventories will undoubtedly be deployed as security for long-term contracts. Such security arrangements should stabilize the market. However, even if one assumes that a large part of the Chinese and Soviet inventories will be held out of the market, whether for strategic or security purposes, a significant amount of world inventory is still considered excess and likely to be sold or lent. **Figure 4** shows NUEXCO's estimate of this excess inventory, which at a minimum is approximately 130 million pounds U_3O_8.

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Any attempts to limit the access of former centrally planned economies to the market would only postpone the inevitable effect of inventory redistribution. All countries, to varying extents, rely on the sale of natural resources to further their economic development, whether it be oil, gas, timber, or minerals like uranium. Quotas, import duties, or embargoes operate essentially to restrict the ability of former centrally planned economies to achieve market-based economies. Whether such efforts are allowed to succeed may, in turn, affect the future stability of political relations among nations. Ironically, those who seek to control market forces end up supporting the inefficient policies of centrally planned economies, while the rest of the world is attempting to entice those nations into full and free world trade.

When government policy or political considerations are allowed to interfere with the free market process, the effects are usually felt for years afterward in ways not previously predicted. The US DOE's fixed-commitment contracting policy for uranium enrichment in a monopolistic period is evidence of this; those effects are still being felt some 19 years later by all market-economy nuclear fuel participants. Consumers may now be reaping the benefits of lower cost fuel, which only partially offsets the high cost of earlier years. Meanwhile, producers are left to absorb the losses from their high investment levels in property, plant, and reclamation.

Barriers to free trade are unlikely ever to disappear completely. Therefore, a central issue for the uranium market is the degree to which government intervention influences what would otherwise be "free trade" and the extent to which such intervention is encouraged by special interests within the industry itself. By its policies and actions, NUEXCO supports full, free, fair trade among all market participants.

We cannot forget, above all, that the future of the nuclear power industry as a whole is primarily dependent on its success in marketing itself to the world's consumers in terms of safety and commercial efficiency, not by making certain inventory holders hold their material from the market, while others either have disposed of or will dispose of their own inventories.

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URANIUM DEPOSITS OF BRAZIL

Brazil is a country of vast natural resources, including numerous uranium deposits (**Figure 1**). In support of the country's nuclear power program, Brazil has developed the most active uranium industry in South America. Brazil has one operating reactor (Angra 1, a 626-MWe PWR), and two under construction. The country's economic challenges have slowed the progress of its nuclear program.

At present, the Poços de Caldas district is the only active uranium production. In 1990, the Cercado open-pit mine produced approximately 45 metric tons (MT) U_3O_8 (100 thousand pounds). Brazil's state-owned uranium production and processing company, Uranio do Brasil, announced it has decided to begin shifting its production from the high-cost and nearly depleted deposits at Poços de Caldas, to lower-cost reserves at Lagoa Real. Production at Lagoa Real is scheduled to begin by 1993. In addition to these two districts, Brazil has many other known uranium deposits, and as a whole, it is estimated that Brazil has over 275,000 MT U_3O_8 (600 million pounds U_3O_8) in reserves.

URANIUM DISTRICTS

Major uranium deposits have been discovered in five primary districts (**Figure 2**). The principal deposits of each district are listed below each district's name, with the name of the state where each deposit is located in given in parentheses:

- Central Ceará District
  - Itataia (Ceará)
- Lagoa Real District
  - Cachoeira (Bahia)
- Poços de Caldas District
  - Agostinho (Minas Gerais)
  - Cercado/Osamu Utsumi (Minas Gerais)
- Seridó District
  - Espinharas (Paraiba)
- Southeastern Paraná Basin
  - Figueira (Paraná)

Other districts with small or low-grade uranium occurrences include:

- Quadrilátero Ferrifero (Minas Gerais)
- Serra de Jacobina (Bahia)
- Rio Preto–Campos Belos (Goiás)
- Northern Paraná Basin, Amorinópolis area (Goiás)
- Tucano Basin (Bahia)

The most important uranium deposits in Brazil are the Itataia deposit with approximately 90,000 MT U_3O_8 of reasonably assured resources (RAR); the Lagoa Real district with approximately 60,000 MT U_3O_8; and the small Espinharas deposit with about 5,000 MT U_3O_8. All three occurrences are associated with Proterozoic metamorphic rocks intruded by leucogranites, and are affected by sodium metasomatism during the Brazilian Orogeny of Late Proterozoic age.

The Lagoa Real and Espinharas deposits are classified as metasomatite-type (albitite) with disseminated uranium mineralization, while the Itataia deposit is vein-type with uraniferous phosphate mineralization. Deposits within the Poços de Caldas alkaline complex of are Upper Tertiary age (Agostinho and Cercado, with approximately 20,000 MT U_3O_8 RAR) and may be termed vein-type or intrusive-type.

Occurrences in the Paraná Basin are of classical sandstone-type emplaced in Middle Permian strata (Figueira deposit—7,000 MT U_3O_8 RAR) and in Lower Devonian sediments (Amorinópolis). Similar mineralization occurs in the Tucano Basin within Lower Cretaceous clastics.

Occurrences in the Rio Preto–Campos Belos region occur in Lower- to Mid-Proterozoic metamorphic rocks and are possibly of unconformity-type. Occurrences in the Quadrilátero Ferrifero and Serra de Jacobina correspond to the oligomictic paleoconglomerate-type.

CENTRAL CEARA DISTRICT

Itataia Deposit

The Central Ceará district is located in northeastern Brazil in the state of Ceará. More than a dozen uranium-phosphate occurrences have been discovered, including Itataia, the largest uranium deposit known in Brazil.

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Figure 1
BRAZIL
Major Uranium Districts

- ① AMORINÓPOLIS
- ② ESPINHARAS
- ③ FIGUEIRA
- ④ ITATAIA
- ⑤ LAGOA REAL
- ⑥ POÇOS DE CALDAS
- ⑦ QUADRILÁTERO FERRIFERO
- ⑧ RIO PRETO - CAMPOS BELOS
- ⑨ SERRA DE JACOBINA

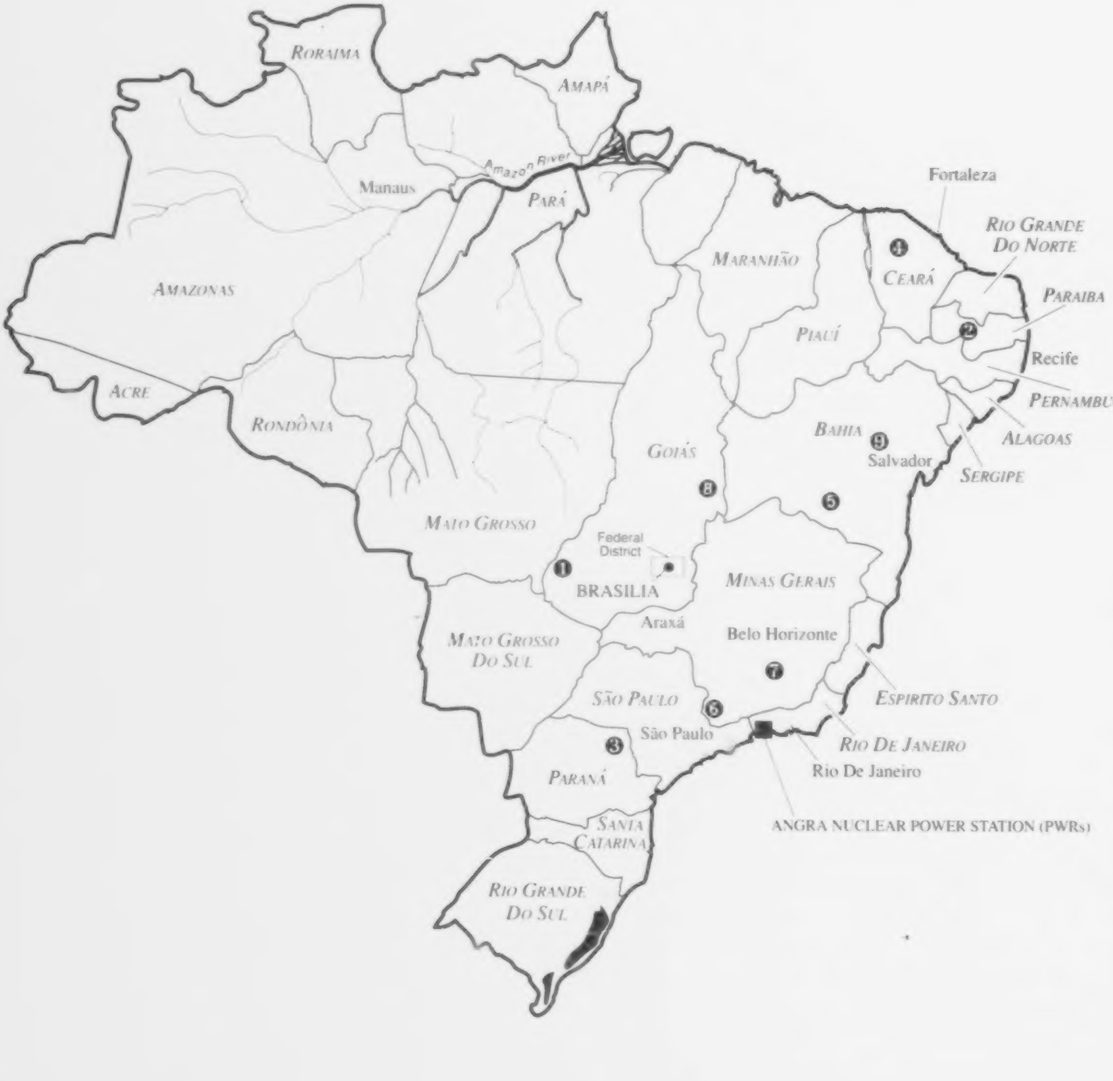
Roraima
Amapá
Amazon River
Manaus
Pará
Fortaleza
Rio Grande Do Norte
Amazonas
Maranhão
④
Ceará
Paraiba
②
Piauí
Recife
Acre
Rondônia
Pernambuco
Bahia
⑨
Salvador
Alagoas
Goiás
Sergipe
⑧
⑤
Mato Grosso
Federal District
①
BRASILIA
Minas Gerais
Araxá
Belo Horizonte
Mato Grosso Do Sul
⑦
São Paulo
⑥
Espirito Santo
São Paulo
③
Rio De Janeiro
Rio De Janeiro
Paraná
Santa Catarina
ANGRA NUCLEAR POWER STATION (PWRs)
Rio Grande Do Sul

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Figure 2
Geological Map[1] with Major Uranium Districts

[1] some deposit types are tentative—not yet confirmed

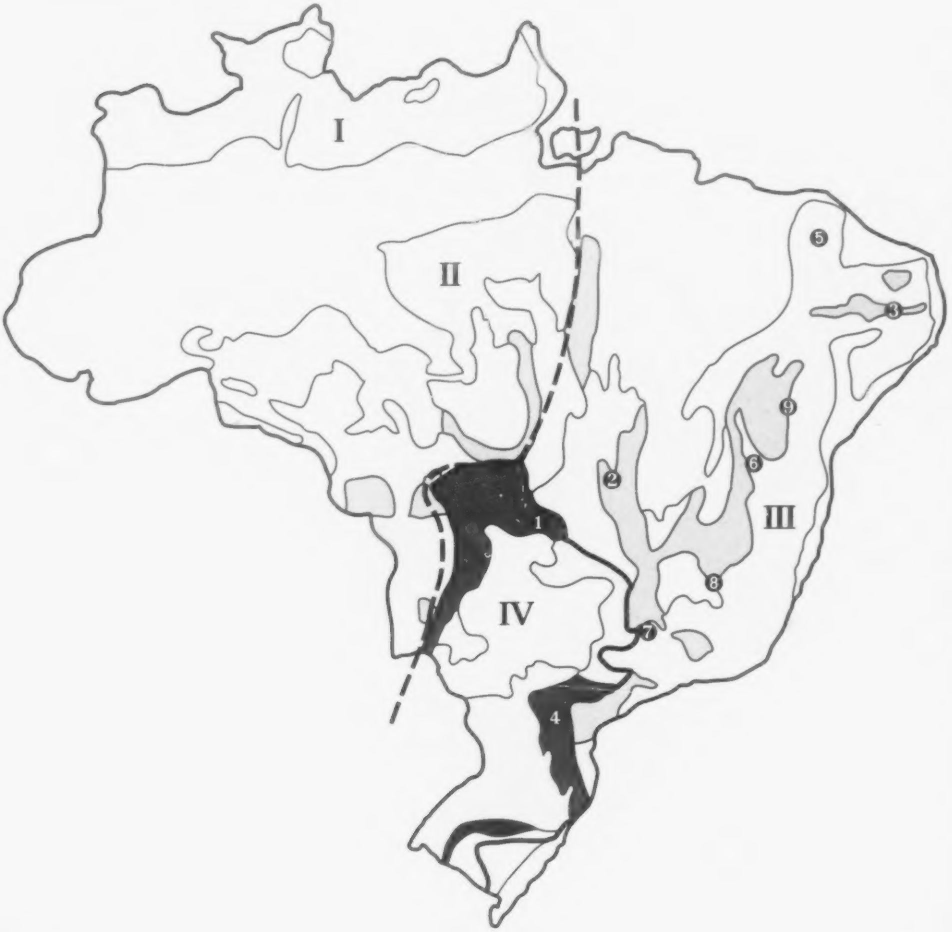
Major Uranium Districts

- ❶ *AMORINOPOLIS*
- ❷ *CAMPOS BELOS*
- ❸ *ESPINHARAS*
- ❹ *FIGUEIRA*
- ❺ *ITATAIA*
- ❻ *LAGOA REAL*
- ❼ *POÇOS DE CALDAS*
- ❽ *QUADRILÁTERO FERRIFERO*
- ❾ *SERRA DE JACOBINA*

IV PARÁNA BASIN [Boundary ▬]
Cretaceous-Jurassic sediments
Cretaceous-Jurassic tholeiitic basalts
■ Triassic sediments
■ Permian-Carboniferous-Devonian sediments

AMAZON CRATON (I+II)
I Guyana Shield
II Brazil Shield
III Atlantic Shield
– – Boundary between Amazon Craton and Atlantic Shield

SHIELD DOMAIN
Phanerozoic (*outside Paraná Basin*)
▨ Precambrian—*dominantly metasediments*
Precambrian and younger—*dominantly granite and gneiss*



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Itataia is located about 170 kilometers west of the coast town of Fortaleza and 50 km southeast of Santa Quitéria. The deposit is an epigenetic, structurally controlled deposit of unusual uranium-phosphorus ore composition. Together with two adjacent deposits (Alcantil and Serrotes Baixos), the deposits account for RAR of about 90,000 MT U_3O_8 at grades ranging from 0.04% U_3O_8 and 5% P_2O_5, to 0.14% U_3O_8 and 21% P_2O_5. Estimated additional resources (EAR) total about 50,000 MT U_3O_8. The deposit is suitable for mining by open-pit methods, with uranium recovery from the phosphatic material estimated at 70 percent.

Other uranium occurrences in the area (Aquiri, Mufumbo and Taperuaba) are associated with episyenites, and are comparable to the Espinharas deposit, which is located 500 km southeast of Itataia in a similar geological environment (see Seridó District).

Geology and Mineralization

Gneiss and carbonate rocks of the Precambrian Caicó Group of the Jaguaribean Fold Belt constitute the principal country rocks at Itataia. The gneissic unit consists of well-foliated biotite-garnet-sillimanite gneiss and amphibolite gneiss. The carbonate unit includes pure and impure marbles with interbedded calc-silicate rocks, which form intercalated lenses or bands as much as 10-km long in gneiss. Numerous post-orogenic granitic and pegmatitic apophyses and stocks, ranging from a few centimeters to tens of meters thick, intrude the older sequences.

The country rocks are altered in various ways. Granite is transformed into a partly vesicular, pinkish rock comparable to feldspar episyenite, as found, for example, in the Limousin, France uranium district. Gneiss exhibits chloritization, sericitization, strong albitization, and impregnation by collophane. Marble underwent scapolitization, superimposed by albitization and fluorapatite crystallization.

The principal uranium mineral is collophane, a cryptocrystalline apatite containing from 60 parts per million (ppm) to more than 150 ppm uranium per one-percent P_2O_5. No discrete uranium mineral has been detected to date. Collophane forms an almost monomineralic rock stained brownish-red from iron-oxide, and referred to as collophanite. It consists of approximately 80-percent collophane, the remainder being calcite, graphite, and ankerite when in marble, and albite, microcline, chlorite, zircon (malacon), and calcite when in episyenite.

Collophanite occurs as:

- massive lens-like lodes filling large cavities, and as veins and veinlets arranged in a stockwork pattern in marble, and to a lesser extent, in episyenite.
- veinlets and disseminations in breccias composed of fragments of marble, calc-silicate and feldspathic (episyenite) rocks.
- disseminations impregnating marble, gneiss, and granite.

Itataia represents a uranium-rich phosphate deposit unique in type and metallogenesis. The mineralization is related to a significant metallogenetic event at the end of the Brazilian Orogeny (450-650 million years ago). The mineralization most likely has a hypogene vein-type origin, but a karst filling genesis may also be envisioned. The only other known notable uranium-phosphate deposits in carbonate rocks outside the former Eastern Bloc countries are Bakouma, Central African Republic, and Pryor Mountains, Wyoming, USA. Both are of supergene origin and associated with karst development.

Shape and Dimension of Deposits

The main deposit at Itataia occurs along a major reverse fault, along which marble has been thrust upon gneiss. A wide cataclastic zone has developed along this fault. Mineralization transgresses the tectonic partitioning.

Surface expression of the Itataia body is 800 m long and 300 m wide, with a fault cutting off the mineralization on the northwest side of the ore body. Massive ore of the first two collophanite modes mentioned above prevails from the surface to a depth of 150 m, and occurs particularly in marble. The third mode extends as discontinuous, lower-grade mineralization to a drill-intersected depth exceeding 300 m.

Massive collophanite hosted in marble, ranges from 0.15% to 0.90% U_3O_8 and 30% to 38% P_2O_5. Respective values in episyenite are 0.07% to 0.15% U_3O_8 and 7.5% to 12.5% P_2O_5, and for stockwork ore in marble the values are 0.04% to 0.1% U_3O_8 and 5% to 15% P_2O_5. Other elements include thorium (162 ppm), yttrium (300 ppm), lanthanum (51 ppm), strontium (3,800 ppm), and locally high values of molybdenum, silver, zinc, and lead in marbles.

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LAGOA REAL DISTRICT

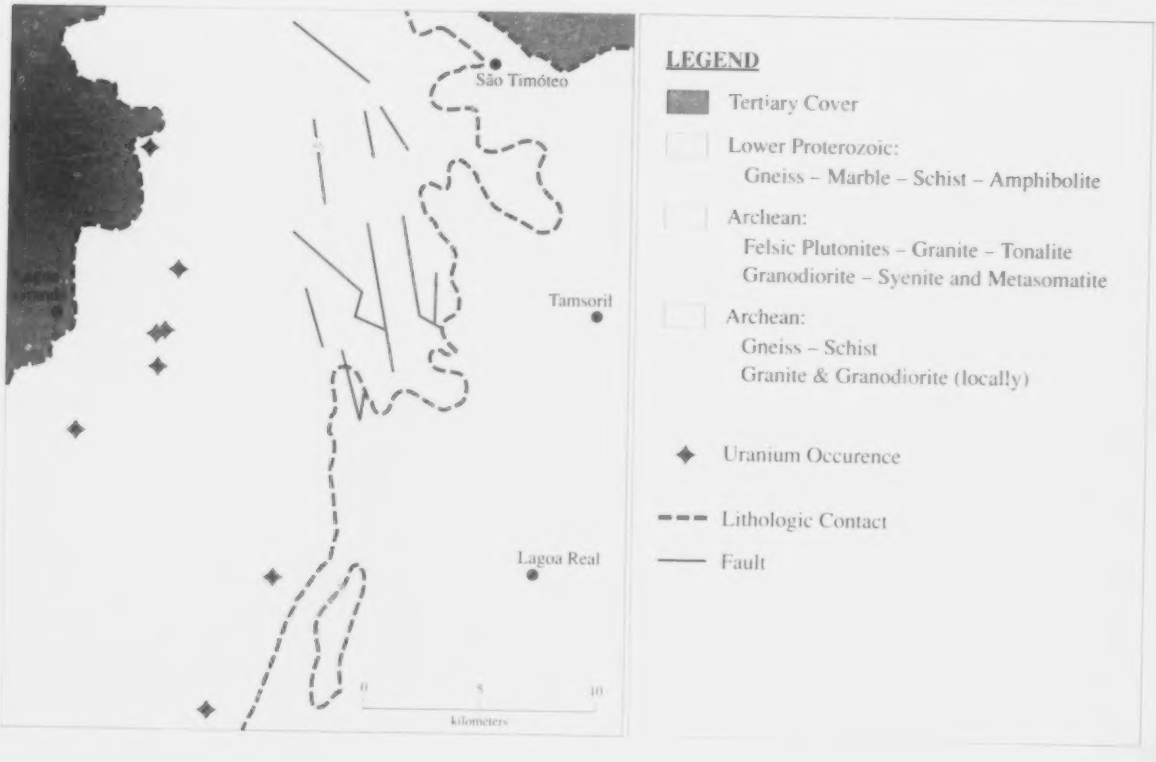
The Lagoa Real district is within the Espinhaço uranium province and situated approximately 20 km northeast of the town of Caetité in Bahia State. Eight major deposits, including Cachoeira, and twenty uranium prospects all associated with albitites of the Caetité Massif, have been discovered to date (**Figure 3**). Total resources of the district amount to about 60,000 MT U_3O_8 (RAR) and 30,000 MT U_3O_8 (EAR). Grades average about 0.15% U_3O_8. Uranio do Brasil is planning to begin uranium production in the Lagoa Real District in 1993. This production will replace that from the higher-cost Poços de Caldas District.

Geology and Mineralization

Polymetamorphic Archean to Lower Proterozoic rocks of the elongated Espinhaço Belt constitute the geological environment of the uranium deposits, with several faults transecting the area.

The principal uranium host rock is an orthogneiss that has been subjected to sodium metasomatism and retrograde alteration. The metasomatism transformed the orthogneiss into rock facies ranging from albite-bearing, microcline-rich, felsic orthogneiss, to albitite. The sodium metasomatism developed along parallel zones, up to several thousand meters long and several hundred meters wide. Uraniferous albitites contain characteristically mafic minerals.

Figure 3
Lagoa Real District Uranium Occurences


São Timóteo
Tamsoril
Lagoa Real
0
5
10
kilometers
LEGEND
▨ Tertiary Cover
☐ Lower Proterozoic:
Gneiss – Marble – Schist – Amphibolite
☐ Archean:
Felsic Plutonites – Granite – Tonalite
Granodiorite – Syenite and Metasomatite
☐ Archean:
Gneiss – Schist
Granite & Granodiorite (locally)
✦ Uranium Occurence
- - - Lithologic Contact
—— Fault

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Uraninite is the principal uranium mineral, while pitchblende is rare. Uraninite occurs disseminated in medium to coarse-grained albitite, where it is always associated with layers of mafic minerals. These mineralized albitites are referred to as "linear albitites" due to their tabular or lenticular configuration. Limited lead/uranium dating yields an age of 820 million years for the uraninite crystallization.

With respect to metallogenesis, the metasomatic process involved hydrothermal solutions, which developed in response to thrusting of the basement over fluid-loaded Proterozoic sediments. The thrust mechanism drove the salty pore waters up into the overriding complex by processes governed by an inverted geothermal gradient.

Shape and Dimension of Deposits

Mineralized albitites are distributed in a 20 km-long, north-south oriented belt. The deposits contain a variable number of mineralized lenticular bodies arranged *en echelon* parallel to the regional foliation. Individual ore lenses are from 50 m to 1,200 m long, and from several centimeters to 40 m wide, with an average width of 6 meters. Ore lenses in any single deposit aggregate to a cumulative thickness of 20 m to 100 m. Down dip depth persistence of mineralization is at least 750 m. The average grade is about 0.15% U_3O_8, but can reach up to 3.5% U_3O_8 locally. Thorium tenor is about 0.01%.

POÇOS DE CALDAS DISTRICT

Poços de Caldas is located approximately 250 km north of São Paulo in the southern part of Minas Gerais State. Poços de Caldas is an alkaline intrusive complex, which is part of a series of alkaline intrusions emplaced in the South Brazilian Shield along the eastern edge of the Paraná Basin. Intrusions include alkaline intrusives and carbonatites. These complexes contain some of Brazil's most important deposits, such as the carbonatite deposit at Araxá, which is the largest niobium deposit of the world. Araxá also contains approximately 500,000 MT of thorium and about 60,000 MT U_3O_8. The Poços de Caldas deposit contains rare earth elements, zirconium, molybdenum, uranium, and bauxite as resources.

The principal uranium deposit in Poços de Caldas is the Cercado deposit, in the southeastern section of the intrusive complex. It has mineralization of the polymetallic intrusive type (**Figure 4**). The other key deposit of the Poços de Caldas district is the smaller Agostinho deposit. It is located about six km northwest of Cercado and has redistributed intrusive type mineralization.

Reasonably assured reserves of the Cercado deposit total approximately 20,000 MT U_3O_8 at an average grade of 0.085% U_3O_8. Additional recoverable elements are molybdenum and zirconium, with resources of 25,000 MT MoO_3 at a grade of 0.11% MoO_3, and 172,000 MT ZrO_2 at 0.81% ZrO_2.

Geology and Mineralization

The Poços de Caldas alkaline complex is a roughly circular caldera structure with a diameter of approximately 30 km intruded into Precambrian gneiss. The complex consists of igneous intrusive, extrusive, and volcanoclastic rocks of Upper Cretaceous to Early Tertiary age. Nepheline syenite facies constitute the bulk of the intrusive material. Volcanic extrusives are represented by ash, tuff, lava, and breccias. The surrounding country rock is Precambrian gneiss.

Discontinuous, narrow (less than 10 cm thick) veins of caldasite (a massive rock essentially composed of the zirconium-oxide and zirconium-silicate minerals baddeleyite and zircon, respectively) occur associated with clay within larger fracture zones. The veins contain an average of 0.34% U_3O_8, and were the target of early uranium exploration. The veins also contain from 40% to 75% ZrO_2. Intense weathering, penetrating locally to a depth of 200 m and more, produced a cover of lateritic soil and bauxite. Two almost perpendicular fault systems dissect the caldera.

Cercado Deposit

The Cercado deposit contains uranium mineralization in three adjacent blocks that are separated by faults (**Figure 5**). The blocks are identified as B, E, and A.

Three principal types of primary ore are distinguished as follows:

- Mineralized veins of uranium, molybdenum, fluorine, and minor amounts of zirconium and thorium, emplaced within steeply dipping breccia dikes up to five meters wide and at least 250 m deep.
- Clusters or pockets with enriched uranium bands located discontinuously along faults, dikes, and diatremes.
- Lenticular zones with disseminated uranium mineralization within pyroclastic rocks.

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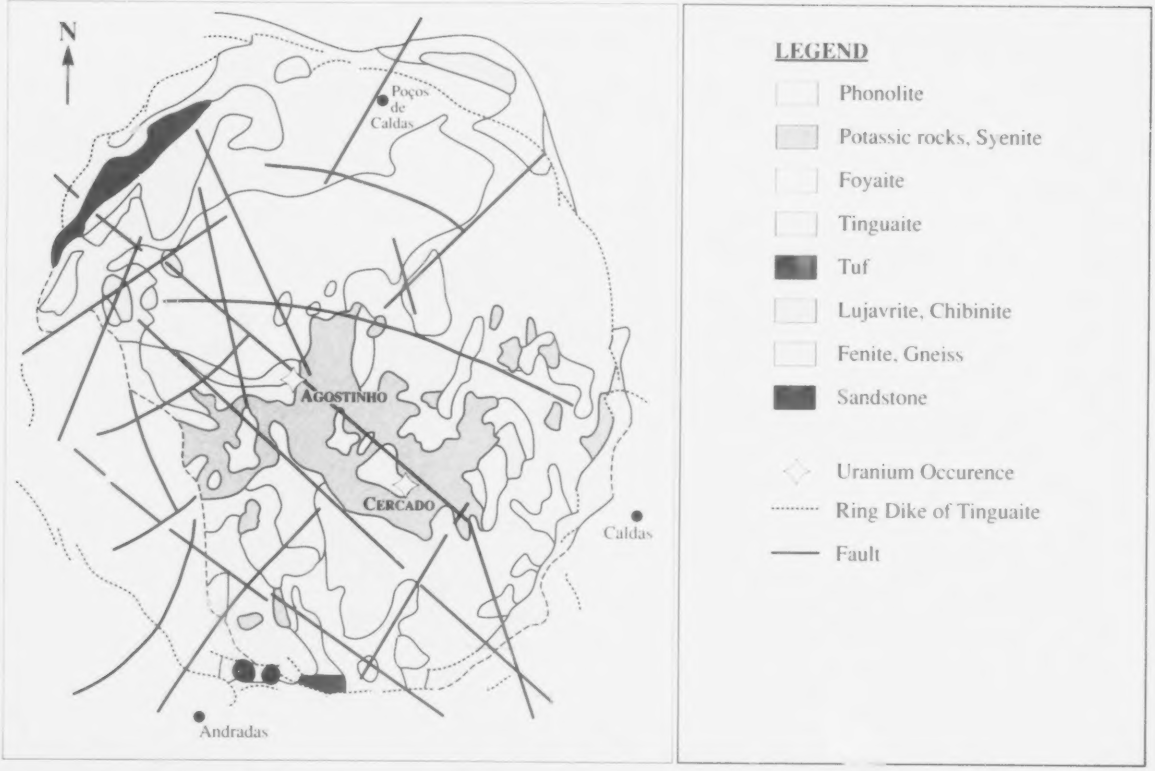
Figure 4
Poços de Caldas Uranium District



With respect to metallogenesis, the original mineralization was derived from pulsations of magmatic mesothermal volatile fluids along fractures, breccia dikes, and diatremes. Weathering resulted in uranium redistribution forming subhorizontal mineralization along and below an oxidation interface.

Mineralization, Shape, and Dimension of Deposits

Block B contains mineralization in an area 1,240 m long, 440 m wide, and 370 m deep. Host rocks are thick pyroclastics that fill a depression. Ore consists of black uranium oxides associated with fluorite, pyrite, and molybdenum minerals. The ore minerals concentrate to shoots or lenses of disseminated mineralization in basal parts of depressions, and uranium grade increases toward the basal contact. Redistributed mineralization occurs in the upper part of the deposit. Block B accounts for about 65 percent of the Cercado reserves, at an average grade of 0.074% U_3O_8.

Block A covers an area about 900 m long and 530 m wide, in which primary mineralization occurs in steeply to vertically dipping dikes of tuffitic breccia with tinguaite fragments. The dikes cut compact lavas. Uranium minerals are pitchblende and coffinite, and may be associated with zircon, baddeleyite, pyrite, fluorite, jordisite, ilsemannite, galena, and sphalerite. Uranium redistribution resulted in local formation of neo-sooty pitchblende. Block A accounts for about twenty percent of the Cercado reserves at an average grade of 0.21% U_3O_8.

Block E is sandwiched between blocks A and B. It occupies a subhorizontal, slightly dipping zone extending 1.1 km in length, 500 m in width, and 140 m in depth. Only redistributed mineralization is present. Uranium is concentrated by adsorption to limonite, which prevails in the upper 10 m, and as uraniferous clay nodules up to 10 cm-thick. The nodules have a mixture of clay and black uranium oxides as a core,

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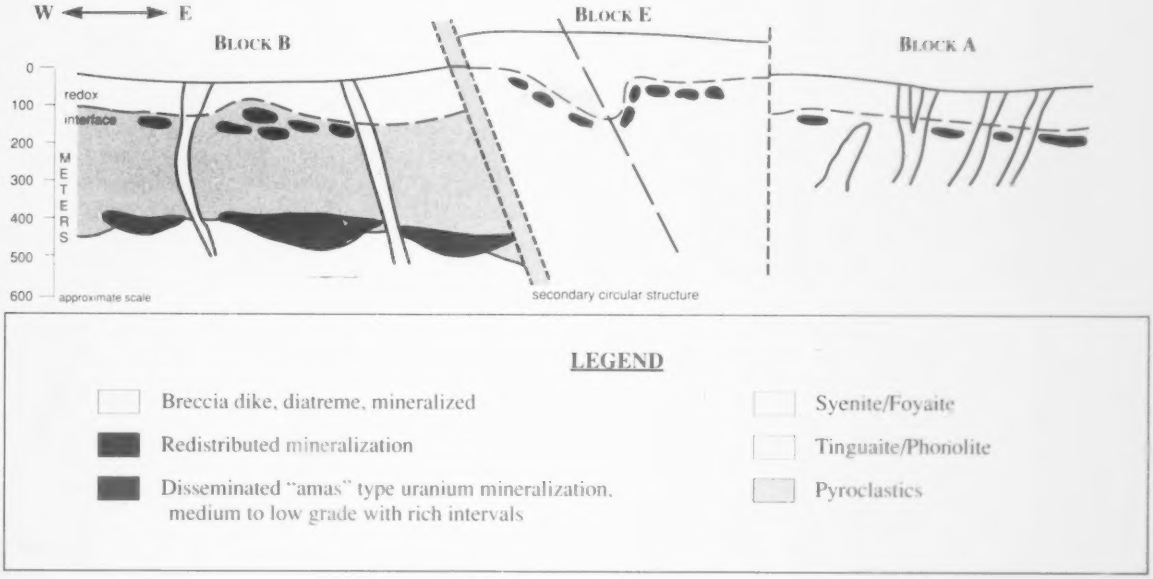
Figure 5
Cercado Uranium Deposit


W ⟷ E
Block B
Block E
Block A
0
100
200
300
400
500
600
METERS
redox
interface
approximate scale
secondary circular structure
LEGEND
Breccia dike, diatreme, mineralized
Redistributed mineralization
Disseminated "amas" type uranium mineralization, medium to low grade with rich intervals
Syenite/Foyaite
Tinguaite/Phonolite
Pyroclastics

and pitchblende with pyrite on the outside. Nodules occur preferentially at the intersections along faults. Uranium mineralization occurs in irregularly shaped accumulations of highly variable tenor and size, hosted by highly fractured and altered tinguaite and phonolite. Block E accounts for fifteen percent of the Cerçado reserves at an average grade of 0.117% U_3O_8.

Production

The Cercado mine (also referred to as the Osamu Utsumi mine) is owned by NUCLEBRAS, and began operation in 1982. It is an open pit operation with a production capacity of 750,000 MT ore per year from the three different blocks. The processing plant (Alamine solvent type extraction) has a capacity of 2,500 MT ore per day, with a recovery rate of approximately 70 percent. The nominal annual production capability is 500 MT U_3O_8 and 285 MT Mo.

Agostinho Deposit

The Agostinho deposit contains mineralization similar to that of Block A at Cercado. Two mineralized bodies occur in subvertically dipping breccia dikes. Mineralization consists of pitchblende and molybdenum minerals (jordisite, molybdenite, ilsemannite) emplaced in a matrix of fluorite, pyrite, sericite, and zircon. Resources are about 5,000 MT U_3O_8 and 7,000 MT MoO_3.

SERIDÓ DISTRICT

Espinharas Deposit

The Seridó district extends from southern Rio Grande do Norte state into north-central Paraiba state in northeastern Brazil. A number of uranium showings have been discovered, mostly within Upper Proterozoic leucogranites, and a few occurrences in Proterozoic metasediments. Those of possible economic potential occur in albitized rocks, and include the Espinharas deposit. This deposit, located 25 km north of the town of Patos in north-central Paraiba state, contains about 5,000 MT U_3O_8 (RAR), and approximately the same amount in the EAR category. The average grade is about 0.1% U_3O_8, at a cut-off grade of 0.05% U_3O_8.

Geology and Mineralization

The Espinharas deposit is situated within the Seridó Basin, which is part of the Cariri Orogenic Belt. Country rocks are Lower Proterozoic metasediments of the Seridó and Caicó groups intruded by several generations of granite during the Brazilian Orogeny.

The predominant rock at Espinharas is amphibolite-biotite gneiss with intercalated minor amphibolite and tacite of the Caicó Formation. A basement complex of Archean granodiorite and porphyritic granite crops out west of the deposit. Numerous alkali-granite, pegmatite, and ultrabasic dikes, ranging in width from several centimeters to as much as 50 m, transect the older rocks. A regional pre-mineralization fault is the prominent structure at the deposit. Many younger faults displace the deposit into numerous blocks.

Host rock alteration is reflected by albitization, arfvedsonitization, hematitization, desilicification, argillitization, chloritization, and carbonatization. Principal host rock is a pink, porous, albitized feldspathic rock, which is considered a metasomatic derivative of a former granite. It occurs as dikes and lenses ranging in width from a few centimeters to 100 meters.

The other main host rock is strongly altered biotite-amphibole gneiss. Identified uranium minerals are predominantly uraninite and betafite. Pitchblende, coffinite, and colored uranium minerals, mainly uranophane, occur in minor amounts. Associated minerals include pyrite, chalcopyrite, and apatite. These uranium minerals are disseminated throughout the albitized host rock and in localized concentrations. In addition to these minerals, a large part of the contained uranium is present as an unidentified, non-refractory complex uranium phase.

No convincing hypothesis on the mineralization at Espinharas has been forwarded as yet. It is speculated that either hypogene hydrothermal fluids caused metasomatism, alteration, and mineralization, or that the Espinharas mineralization is derived by processes comparable to those that formed the episyenite-hosted mineralization in the Ceará district.

Shape and Dimension of Deposits

Uranium mineralization extends over a length of 2,200 meters, a width (at surface) of 20-120 meters, and a depth of 250 meters. Ore occurs in discontinuous and irregular lenses that are a few centimeters to several tens of meters thick. The lenses are stacked in *en echelon* pattern parallel to the regional foliation. The average grade of most of the ore is 0.1% U_3O_8 with intercalated sections exceeding 0.12% U_3O_8.

PARANÁ BASIN

The Paraná Basin spreads over the southern part of Brazil and into neighboring Argentina, Paraguay, and Uruguay. Two districts with sandstone-type uranium deposits in Paleozoic sediments have been discovered: Figuiera, in northeastern Paraná State, with approximately 8,000 MT U_3O_8 in Permian sediments; and Amorinópolis with approximately 5,000 MT U_3O_8 in Devonian sediments, located about 800 km north of Figueira in Goiás state. Several other uranium occurrences, most of small size, are located in the Paraná Basin: Alfredo Wagner and Domo de Lájes in Santa Caterina state; Teresa Christina and Cándido de Abreu in Paraná; Lages in Santa Catarina; Domo de Araguainha in Mato Grosso state; and in the Melo-Fraile Muerto area of northeast Uruguay, near the Brazilian border.

FIGUEIRA DISTRICT

The district lies near the central-eastern margin of the Paraná Basin, about 400 km west of São Paulo. Several sandstone-type uranium occurrences such as Siqueira Campos, Ibaiti, Carvaozinho, Figueira, Sapopema, and Telemaco Borba have been detected in a 100 km long belt along the outcropping Permian Rio Bonito Formation.

Figueira Deposit

The best known deposit is Figueira, located 5 km northwest of the village of Figueira. It contains about 8,000 MT U_3O_8 at grades varying between 0.02% and 0.50% U_3O_8.

Geology and Mineralization

The deposit is situated in the middle unit of the three-unit Permian Rio Bonito Formation. This uranium host unit is approximately 85 m thick, and consists of siltstone intercalated with limestone, carbonaceous mudstone, coal seams, and carbonate cemented sandstone. Uranium is hosted by sandstone, carbonaceous siltstone, and coal.

Uranium is present as pitchblende and minor coffinite in the carbonate matrix of sandstone, and in urano-organic complexes with phosphate and barium in siltstone and

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carbonaceous claystone and coal. Associated elements are molybdenum, zinc, lead, copper, arsenic, thorium, and traces of selenium, vanadium, nickel, and germanium. Pyrite is ubiquitous in uraniferous sections.

A multistage model is proposed for the metallogenesis. Initially, uranium was syngenetically introduced and concentrated in the paludal sediments, while epigenetic processes concentrated uranium in coarse-grained channel sandstone. Diagenetic activity redistributed the uranium.

Shape and Dimension of Deposits

The main ore body of Figueira is of lenticular configuration and located in a channel measuring 600 m long and 300 m wide. Individual mineralized layers in the channel range from 1.5 to 3.5 m thick, and contain about 0.2% to 0.5% U_3O_8. Uranium grade drops to between 0.02% and 0.08% U_3O_8 outside the channel. The ore is in radiometric disequilibrium about 20 percent in favor of chemical uranium. Thirty to forty percent of the resources are contained in carbonaceous siltstone and coal.

AMORINÓPOLIS DISTRICT

A great number of uranium showings have been discovered in the Devonian Porta Grossa Formation along the northeastern margin of the Paraná Basin. The most explored occurrences are those in the Amorinópolis–Iporá area, situated about 375 km southwest of Brasilia. They contain low-grade uranium resources estimated at 5,000 MT U_3O_8.

Geology and Mineralization

The Middle Devonian Porta Grossa Formation consists of siltstone, sandstone, and mudstone which rest on sandstone of the Silurian Furnas Formation and Precambrian crystalline basement. During the Cretaceous Era, block faulting resulted in horst and graben structures, and dikes of ultrabasic and alkaline composition intruded. Three settings for uranium mineralization are present. They are associated with:

- Redox fronts in feldspathic sandstone filling inconspicuous paleochannels.
- Fractures and faults, some them occupied by ultrabasic and alkaline dikes.
- Laterite capping large areas, particularly mesa buttes.

The first type constitutes the most important uranium mineralization and includes the Amorinópolis deposit. Host rock is a 3-8 m thick carbonaceous feldspathic sandstone containing oxidized horizons. Uranium occurs in clay galls rich in organic matter and iron-oxides, and in irregular distributions on bedding planes and in fractures.

Mineralization, although irregular in grade, is fairly continuous and can be traced along channels about 400 m long, 20-40 m wide, and 1-10 m thick. The uranium appears to be controlled primarily by coarse-grained sandstone embedded between mudstone or siltstone layers. Certain structural control has been exerted by faults, dikes, and sills. Uranium minerals include pitchblende and coffinite at depth, and colored uranium minerals in weathered zones. Metallogenetic models include epigenetic rollfront-type processes as well as syngenetic uranium concentrations.

QUADRILÁTERO FERRIFERO DISTRICT

This district is in the southern part of Minas Gerais state. Two areas with oligomictic, quartz-pebble type uranium mineralization have been explored in some detail: Serra das Gaivotas and Gandarela. Cumulative resources are estimated at 15,000 MT U_3O_8, with grades up to 200 ppm uranium and 0.5 ppm gold. Similar mineralization also occurs at Onca do Pitangui, located about 100 km northwest of Belo Horizonte.

Geology and Mineralization

Archean and Lower Paleozoic rocks constitute the Quadrilátero Ferrifero. They include the uraniferous Lower Proterozoic Moeda Formation, which rests unconformably on Archean granite and gneiss. A prominent paleorelief has developed locally on the basement, with variations in altitude exceeding 100 meters. Consequently, the Moeda Formation ranges in thickness from 15 m to 320 m.

Serra das Gaivotas Deposit

The deposit is located 30 km south of Belo Horizonte in the western part of the Quadrilátero Ferrifero. Uranium and low-grade gold mineralization occurs in paleochannels filled with oligomicitc quartz-pebble conglomerate up to 5 m thick near the base of the Moeda Formation. Quartz and rare quartzite pebbles from 2 to 3 cm in diameter are the principal clasts. They are embedded in a matrix of sericite and quartz, with abundant pyrite (5-20 volume-percent) and heavy minerals. The matrix constitutes 60-80 volume-percent of the rock, and contains as principal uranium minerals uraninite, pitchblende, coffinite, and thucholite. Other heavy minerals are monazite, zircon, rutile pyrrhotite, chalcopyrite,

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pyrite, and traces of gold. Uranium tenor is about 100 ppm. The ThO_2/U_3O_8 ratio ranges from 0.11 to 1.15 and averages 0.46. The origin of the uranium, gold, and other heavy minerals is syngenetic. Later processes modified the primary mineralization.

Gandarela Deposit

The deposit is located 65 km southeast of Belo Horizonte in the central part of the Quadrilátero Ferrifero. Mineralization corresponds to that at Serra das Gaivotas and is hosted by highly matured oligomictic conglomerates containing pyrite and carbonaceous material. Gold is commonly associated with uranium at the base of the Moeda Formation. Resources are estimated at 8,000 MT U_3O_8.

SERRA DE JACOBINA DISTRICT

The Serra de Jacobina district is located in north-central Bahia state. Mineralization is of the oligomictic conglomerate type similar to the Witwatersrand uranium-gold deposits of South Africa.

Geology and Mineralization

Uranium and gold mineralization occurs in conglomerates of the Serra de Corrego Formation at the base of the Lower Proterozoic Jacobina Series, which is correlated with the Minas Series in the Quadrilátero Ferrifero. The Jacobina Series is a folded and metamorphosed sedimentary sequence several thousand meters thick. It consists of thin-bedded to massive quartzite and conglomerates, overlain by itabirites in the lower section and phyllites higher up. The metasediments unconformably rest on Archean granite and gneiss of the São Francisco Craton. Faults, and basic to ultrabasic dikes, dissect the whole complex.

Four conglomeratic horizons are known in the lower section of the series, two of which, the Liberino Reef and the Piritoso Reef (each 1.5-2.5 m thick), are uraniferous and lie at least 150 km above the unconformity. The two horizons are composed of well-compacted quartz pebbles two to four centimeters in diameter, embedded in a highly silicified quartz-sericite matrix containing abundant pyrite and chlorite. The principal uranium minerals are uraninite, pitchblende, and brannerite. Other heavy minerals include rutile, zircon, pyrite, and chromite. The latter constitutes up to 35 percent of the heavy mineral fraction in gold operations. Uranium and gold tenors in the Canavieiras gold mine near Jacobina range from 100 to 200 ppm, and 7 to 15 ppm, respectively.

RIO PRETO–CAMPOS BELOS DISTRICT

The district is located north of Brasilia, in the eastern part of Goiás state. A number of small, structurally controlled uranium showings have been discovered, most of them in the Rio Preto area. Numerous showings also occur 140 km further northeast in the Campos Belos area. Total resources for the district are estimated at 1,000 MT U_3O_8.

Geology and Mineralization

The regional geology comprises an Archean to Lower Proterozoic basement complex (granite gneiss with subordinate migmatite and pegmatite) which hosts the uranium occurrence of Campos Belos. Some granite intrusives have been altered to form tin greisens that are associated with gold and high uranium contents.

The basement is overlain by the Lower Proterozoic Ticunzal Formation, host to the uranium occurrences at Rio Preto, where two major types of host rocks are present:

- Cataclastic, graphitic, biotite-muscovite schists with pegmatite injections and quartz veins contain, on schistosity planes and in fractures, uraninite in depth, and hexavalent uranium minerals near the surface.
- Dike-like bodies of biotite schist, with locally abundant hornblende and apatite locally, are emplaced with sharp contacts in paragneiss, and both are affected by cataclasis. Biotite is a recrystallization product of metasomatism. Uranium, at depth as uraninite, is irregularly and discontinuously dispersed in small fractures along the contact to paragneiss.

Uranium is associated with pyrite and chalcopyrite. Host rocks are commonly altered by chloritization, hematitization, and argillitization. Schists containing little biotite are principally barren of uranium.

More than ten mineralized zones have been explored in some detail at Rio Preto. They typically are a few hundred meters long and about one hundred meters wide. The larger mineralized structures average 0.85 m thick, and extend at least 80 m deep, with a grade 0.06-0.20% U_3O_8, and may contain several hundred metric tons U_3O_8.

Mineralization at Campos Belos is in fault-controlled, cataclastic leucocratic gneiss of the Basal Complex. Ore shoots are 2-3 m thick and extend at least 60 m deep.

Hypotheses on ore formation range from supergene to hydrothermal related, to granite intrusion or lateral-secretionary related, to final tectonic phases of the Brazilian Orogeny, with redistribution of uranium from earlier vein deposits along the Proterozoic unconformity.

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NUCLEAR INDUSTRY CALENDAR

1991

Sept. 22-25	***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 29-Oct. 2	***American Mining Congress Mining Convention*** (Salt Lake City, Utah). Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.
Oct. 24	***Canadian Participation in World Fusion: Opportunities and Challenges*** (Skyline Hotel, Ottawa, Canada). Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society. Contact: Sylvie Caron, CNA; 416-977-6152; Fax: 416-979-8356; or mail: 144 Front St., Suite 725, Toronto, Ontario, Canada M5J 2L7.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES; 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department; 708-352-6611.
Nov. 14-15	***World Electricity Conference*** (Hotel Inter-Continental, London, United Kingdom). Sponsored by the Financial Times and Power In Europe. Contact: FT Conference Organization; 126 Jermyn Street, London SW1Y 4UJ, UK; Phone: 071-925-2323; Fax: 071-925-2125; Telex: 27347 FTCONF G.
Dec. 2-4	***PLEX '91 BERLIN – Nuclear Plant Life Extension, Upgrading, Repair, Refurbishment, Uprating and Ageing*** (Hotel Steigenberger, Berlin, Germany). Sponsored by Nuclear Engineering International. Contact: Conference (PLEX); Status Meetings Ltd., Festival Hall, Petersfield, Hampshire, GU31 4JW, UK; Phone: 44-730-66544; Fax: 44-730-68865; Telex: 86105 CONFER G.

1992

April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department; 708-352-6611.
May 5-7	***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany). Sponsored by the German Nuclear Society and the German Atomic Forum. Contact: Congress Office JK'92: INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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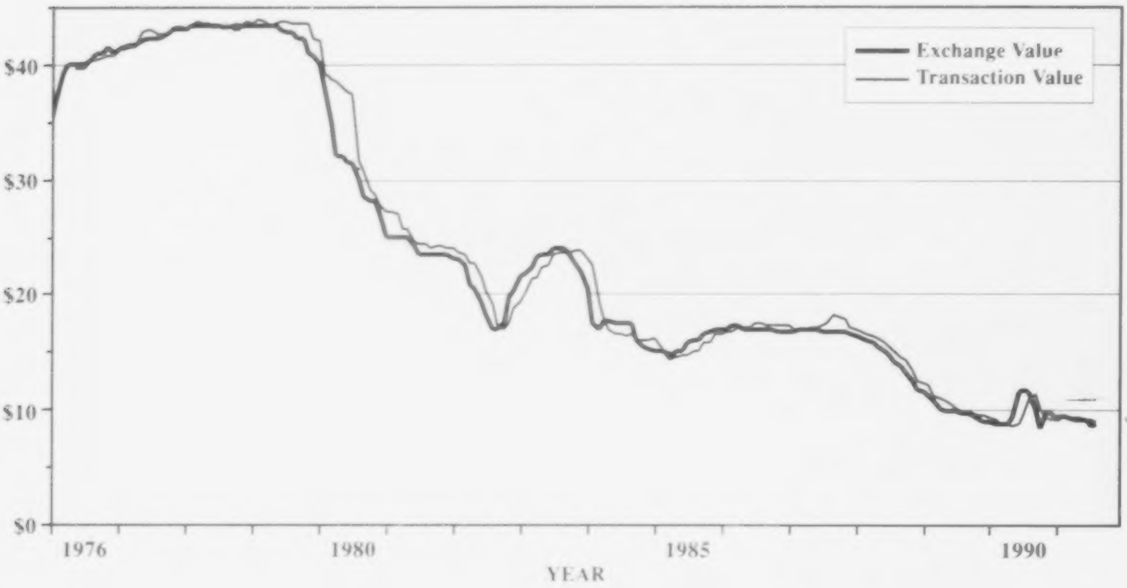
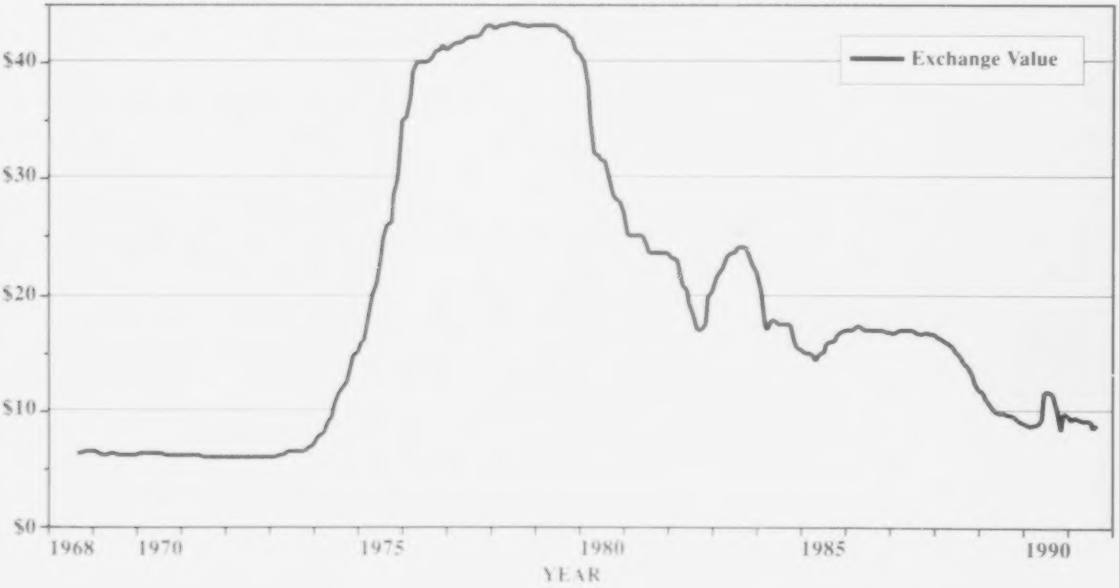
NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	**8.75**				

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF$_6$ Values

Determined as of the last day of the month indicated ($US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	**26.25**				

US Premium (Relative to the UF$_6$ Value)

Determined as of the last day of the month indicated ($US/kg U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Determined as of the last day of the month indicated ($US/lb U as UF$_6$)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	**1.60**				

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	**8.95**				

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	**67**				

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Loan Rates

Year	Determined as of the last day of the month indicated (Percent per Annum)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**				

* Float with Prime Rate

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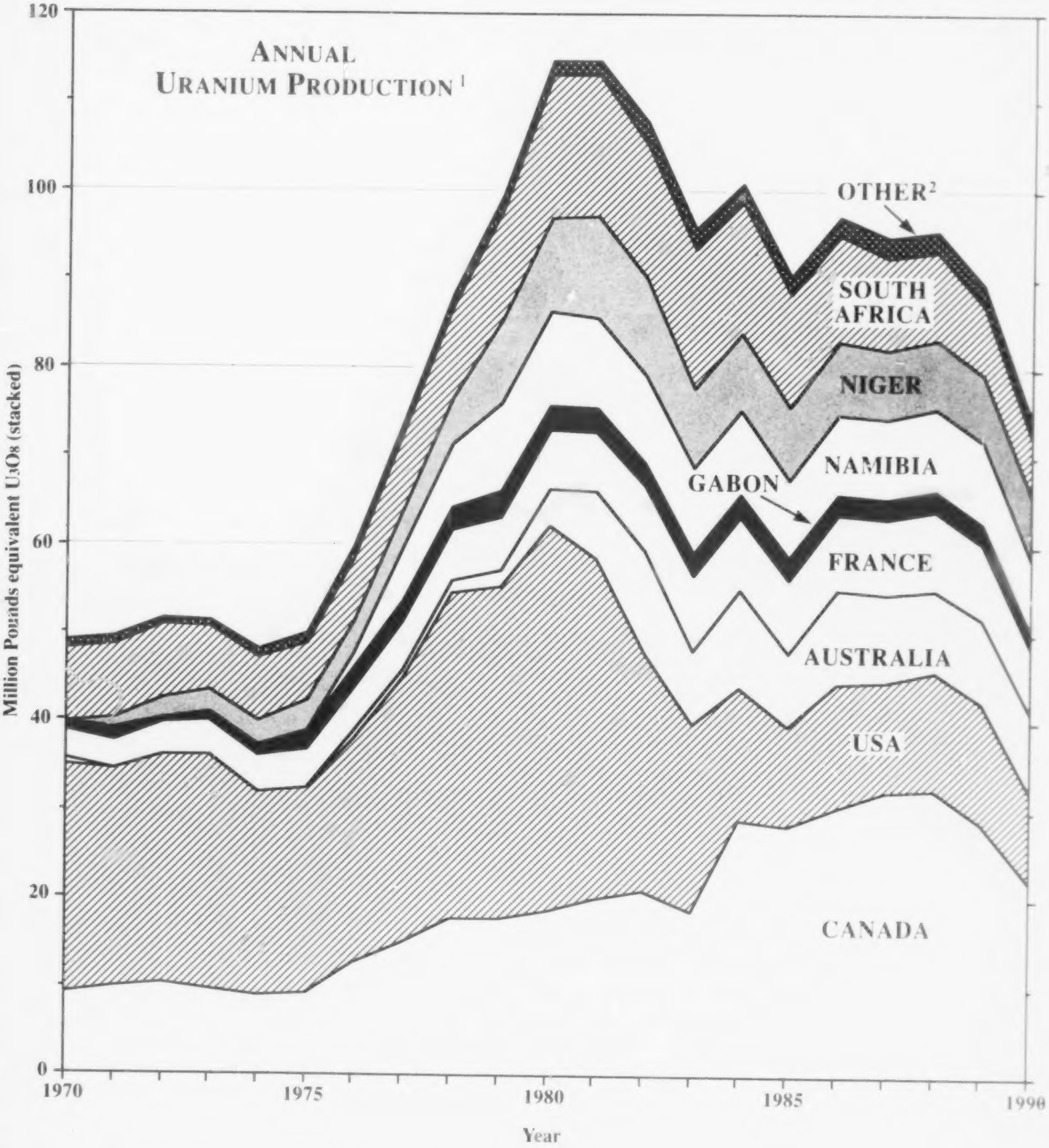

[1] Estimated world uranium production in 1990 totalled 85.2 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] Other includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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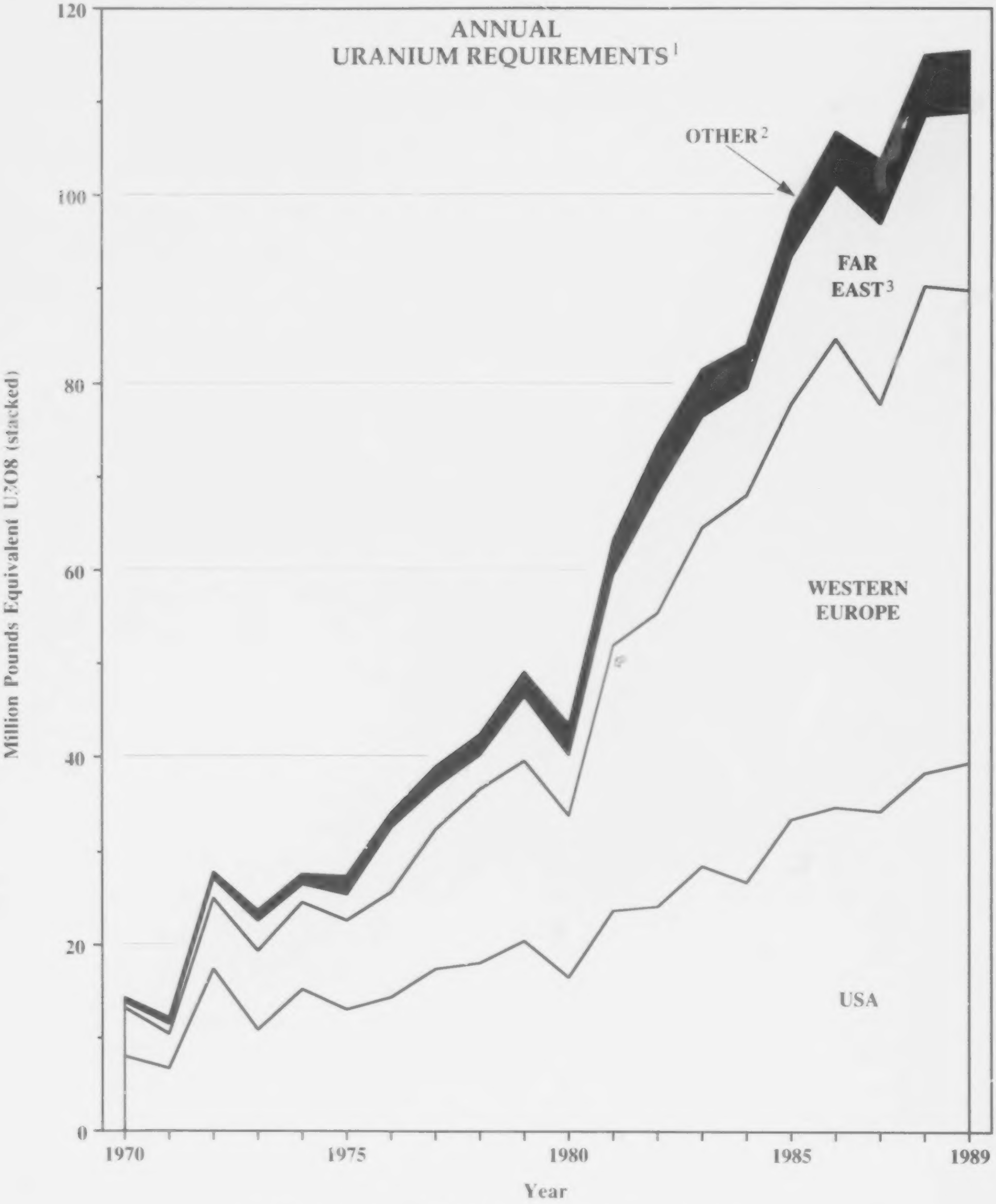
HISTORICAL MARKET DATA



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[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg	95.8	83.1	—	140.8[6]
1981	Avg	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0
Sept	1990	208.9	128.2	—	130.2
Oct	1990	—	134.1	—	130.4
Nov	1990	—	133.7	589.20	130.4
Dec	1990	214.5	128.8	—	130.6
Jan	1991	—	125.6	—	130.6
Feb	1991	—	121.5	—	130.5
Mar	1991	214.1	119.1	—	130.7 **R**
Apr	1991	—	117.6	—	130.9 **R**
May	1991	—	117.8	—	130.9 **R**
June	1991	214.4	120.4	—	130.9

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).
[6] Base: June 1976 = 100.

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GOVERNMENT STATISTICS

Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	–·–	–·–	–·–	–·–	–·–
1981	Avg.	83.4	75.5	–·–	–·–	–·–	–·–	–·–
1982	Avg.	89.0	83.7	–·–	–·–	–·–	–·–	–·–
1983	Avg.	92.1	88.5	17.22	–·–	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	–·–	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6**R**	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6**R**	126.1	24.38**R**	22.17**R**	20.25**R**	15.05**R**	16.55**R**
June	1991	108.5**R**	126.7	23.58**P**	22.13**P**	19.90**P**	14.65**P**	16.51**P**
July	1991	108.2	126.8	–·–	–·–	–·–	–·–	–·–

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	660,151	942,831
Jan	1991	—	—	219.5	216.1 R	648,944	935,839
Feb	1991	—	—	222.2	216.9 R	650,948	893,373
Mar	1991	137.66	323.82	224.1	215.3 R	640,039	905,490
Apr	1991	—	—	227.3	216.5 R	636,295	882,106
May	1991	—	—	230.8	218.4 R	—	—
June	1991	134.65	317.23	232.4	—	—	—
July	1991	—	—	235.3	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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GOVERNMENT STATISTICS

United States

		Producer Price Index [1]		Consumer Price Index [2] (1982-1984 = 100)	GNP Implicit Price Deflator [3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$) [4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	1[illegible].8	14.93	14.55	13.85	10.55
Apr	1991	115.5	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52**R**	14.01**R**	10.66**R**
June	1991	116.0	116.3	136.0	136.1	14.93**P**	14.52**P**	14.06**R**	10.74**R**
July	1991	—	—	136.2	—	—.—	—.—	14.23**P**	10.79**P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1989: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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CORRECTION

NUEXCO wishes to clarify a statement printed on page 25 in the August 1991 Monthly Report (issue no. 276), in the article entitled "Uranium Exploration and Development Update." The section on Energy Resources of Australia's (ERA) purchase of Pancontinental's Jabiluka uranium deposit contained some sentences stating that ERA, 65-percent owned by North Broken Hill Peko, intended to process Jabiluka ore at its nearby Ranger mill and export the ore under Ranger's existing license, thereby circumventing the Australian Labor Party's present three-mine policy.

NUEXCO did not intend to imply that ERA was attempting to bypass current government restrictions. The purchase was an investment decision by ERA shareholders, and was made with the expectation that, by the time Jabiluka is developed, government policy will have changed. Any other interpretation is inaccurate.

P-8000-1A

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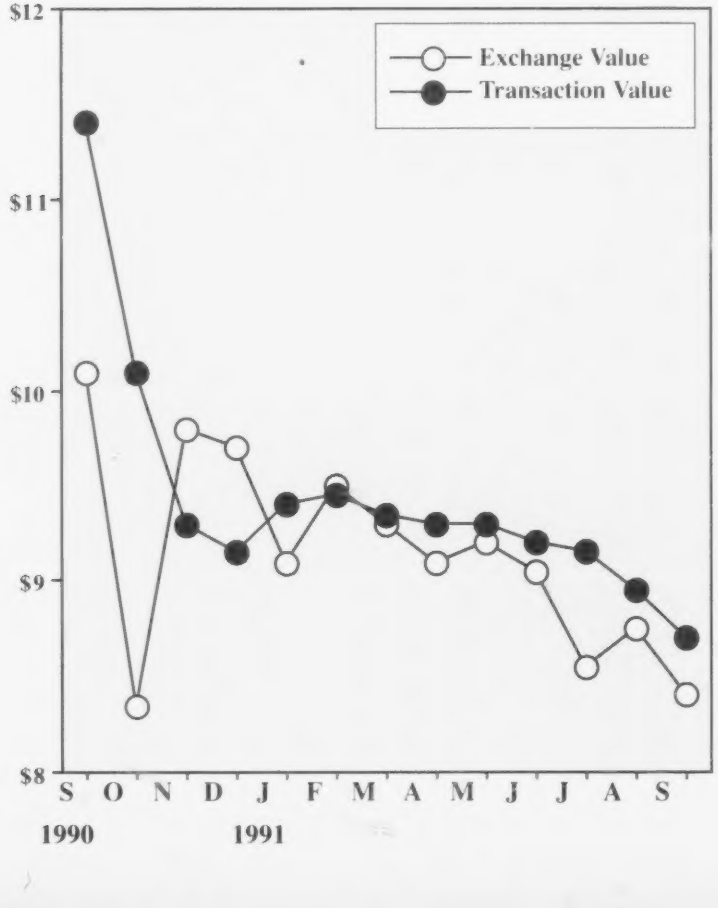

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- **World Association of Nuclear Operators**

One of the most significant steps toward assuring the future of nuclear energy was the signing of an agreement by nearly all of the world's nuclear utilities establishing the World Association of Nuclear Operators (WANO). Public concern over the safety of nuclear power was seen as a major obstacle to the growth of the industry, and WANO was developed with the goal of improving the operational safety of all nuclear plants worldwide.

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Complete historical tables by month of our regularly featured government statistics for Australia, Canada, South Africa, and the USA are updated to the most recent base-year index and provided as a current reference.

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To Our Readers

NUEXCO is pleased to announce that **Charles E. Foreman** has joined our organization. Chuck has over 25 years of experience in nuclear electric power generation with General Electric, Westinghouse, and Management Analysis Company (MAC). During the past three years, Chuck worked as a management consultant for MAC. His projects included the national high-level-waste repository site characterization project at Sandia National Laboratories, the DOE new production reactor, and laser enrichment. Prior to those assignments, he was GE's Manager of Fuel Components and Fabrication Projects, and Manager of International Fuel Projects responsible for interfacing with utilities and fuel fabricators in Europe, Asia, and the USA. Chuck also worked as a start-up test physicist on several land and sea-based plants for GE and Westinghouse. He earned a Masters degree in physics from Case Institute of Technology and is a registered professional engineer. Chuck is based in Denver and is working in NUEXCO Information Services as a Senior Analyst.

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MARKET REVIEW

Market Values Summary

NUEXCO Market Values	This Report September 30, 1991	Last Report August 31, 1991	12 Months Ago September 30, 1990
EXCHANGE VALUE[1]	**$8.40**/lb equivalent U_3O_8	$8.75	$10.10
UF_6 VALUE[2]	**$25.50** /kg U as UF_6	$26.25	$29.50
LOAN RATE[3]	**3.5%** /annum	3.5%	3.5%
CONVERSION VALUE[4]	**$1.55**/lb U as UF_6	$1.60	$1.45
SWU VALUE[5] (0.3 w/o tails assay)	**$67**/SWU	$67	$50
TRANSACTION VALUE[6]	**$8.70**/lb equivalent U_3O_8	$8.95	$11.40
Transactions	**20**	26	15
Months	**3**	3	3
Millions of Pounds	**4.4**	5.9	3.7

DEFINITIONS

[1] The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

[2] The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

[3] The **Loan Value** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

[4] The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

[5] The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

[6] The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;
b) At least ten transactions;
c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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SEPTEMBER MARKET REVIEW

(as of September 30, 1991)

OVERVIEW

Limited demand and abundant supply combined to push uranium prices lower during September. The Exchange Value fell $0.35, to $8.40 per pound U_3O_8, while the UF_6 Value dropped to $25.50 per kgU as UF_6 on September 30, 1991, down from the August 31 Value of $26.25. Six near-term uranium transactions were reported, totalling over 1.6 million pounds equivalent U_3O_8. Four of the sales involved concentrates, one involved natural UF_6, and the other involved enriched uranium product (EUP). Two long-term uranium sales also were reported, totalling over 1.7 million pounds equivalent U_3O_8.

Year-to-date near-term uranium market volume has reached 19.3 million pounds equivalent U_3O_8 in 82 sales (**Table 1**). While the number of sales thus far is comparable to 1990's level of 88 sales, this year's cumulative volume is lagging far behind 1990's record pace of 34.1 million pounds (through September). This is primarily due to a lack of large discretionary purchases. Many buyers believe that low uranium prices will continue in the near-term and are purchasing selectively when prices appear attractive.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	September 1991		Year-to-Date	
	No. of Sales	Volume[1]	No. of Sales	Volume[1]
Concentrates	4	0.8	55	11.8
Natural UF_6	1	0.1	18	5.3
EUP	1	0.7	9	2.2
Total[2]	**6**	**1.6**	**82**	**19.3**

[1] Million pounds equivalent U_3O_8

[2] Due to independent rounding, columns may not equal total.

The Loan Rate remained unchanged at 3.5 percent per annum. Two loans for a total of over one million pounds equivalent U_3O_8 were reported in September. In the conversion market, competition among suppliers resulted in a $0.05 adjustment of the Conversion Value, down to $1.55 per pound U as UF_6. One sale was reported involving a moderate quantity of conversion services.

The near-term enrichment market stabilized and the SWU Value was unchanged at $67 per SWU. Three near-term and seven long-term enrichment sales were reported, involving a total of almost four million SWU.

URANIUM AND CONVERSION

The **Exchange Value** dropped $0.35, to **$8.40** per pound U_3O_8. Weak demand was the key reason for the decline. Limited sales opportunities led to increased downward pressure on the market as sellers became anxious to complete transactions prior to year-end. The little demand that existed was filled early in the month with four of the six uranium sales made during the first week of September. By month-end, sellers were competing aggressively on every sales opportunity. The existence of abundant supply and limited demand will continue to exert downward pressure, and is likely to persist until low prices entice discretionary buyers into the market, or until sellers withdraw from such a market.

Four near-term concentrates sales were reported during September; three utilities and a producer purchased almost 800 thousand pounds equivalent U_3O_8 from intermediaries for delivery before the end of the year.

* * *

The **UF_6 Value** also declined, falling $0.75, to **$25.50** per kgU as UF_6. The UF_6 market continues to take its cues from the concentrates market. Minimal demand for UF_6, combined with a greater abundance of supply in the form of

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concentrates, has led to very little activity in the UF_6 market in the past few months. As a result, both buyers and sellers look to the concentrates market for price trends when evaluating UF_6 as an alternative.

Two near-term sales involving UF_6 were reported during September: one involved over 100 thousand pounds equivalent U_3O_8 as natural UF_6; the other included over 700 thousand pounds equivalent U_3O_8 as EUP. In the EUP sale, a utility purchased the material from an intermediary for delivery during the second quarter of 1992.

* * *

In the long-term uranium market, two sales were reported, one involving concentrates and the other involving EUP. Together, the two utility purchases totalled over 1.7 million pounds equivalent U_3O_8 for delivery during the period 1992-1995.

* * *

The **Transaction Value** dropped $0.25, to **$8.70** per pound U_3O_8 based on 20 transactions over 3 months involving 4.4 million pounds equivalent U_3O_8.

* * *

Active uranium supply declined by over 1.5 million thousand pounds, to **5.1** million pounds equivalent U_3O_8, but still overwhelms **active uranium demand**, which also declined, falling to only **450** thousand pounds equivalent U_3O_8. As a result, the new **supply/demand ratio** rose to **11.4** to 1, demonstrating not only the abundance of supply, but particularly the extremely low level of demand.

* * *

The **Loan Rate** remained at **3.5** percent per annum. In September's two loans, a utility and a producer lent a total exceeding one million pounds equivalent U_3O_8 at levels near the prevailing Loan Rate. Loan supply climbed back to nearly 6.5 million pounds equivalent U_3O_8 (**Table 2**), while loan demand remained at zero. Any loan demand that does arise during a month is quickly met by lenders, who are eager to lend their material.

* * *

The **Conversion Value** was adjusted downward $0.05, to **$1.55** per pound U as UF_6, reflecting the price level at which substantial supply is available. Active conversion supply now exceeds 2.5 million pounds U, while active conversion demand has fallen to zero. This lack of demand may have stalled the recent trend of rising prices. One near-term transaction was reported in which a utility purchased a moderate quantity of conversion services at a price near the September 30 Conversion Value.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	5,115	450
• Supply/Demand Ratio:	11.4	
• Loan (thousand lbs equivalent U_3O_8)	6,485	0
• Conversion (thousand lbs U as UF_6)	2,570	0
• SWU (thousand SWUs)	450	480

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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ENRICHMENT SERVICES AND ENRICHED URANIUM PRODUCT

The **SWU Value** was unchanged at **$67** per SWU as prices stabilized during September. However, the market remained fairly active with three near-term enrichment sales reported. European and US utilities purchased a total of over 300 thousand SWU at prices at or near the September 30 SWU Value. One of the sales involved SWU contained in EUP.

In the the long-term SWU market, activity remained brisk as seven sales were reported. European and US utilities purchased over 3.5 million SWU for delivery during the period 1992-2001. Suppliers include an intermediary and several primary enrichers. At month end, at least ten utilities were still evaluating long-term offers for up to 10 million SWU, so the market promises to remain active in the coming months.

Table 3
ENRICHMENT PRICES
(September 30, 1991)

Prices	This Month Report 278	Last Month Report 277	12 Months Ago Report 266
NUEXCO SWU Value ($US per SWU)	67	67	50
US DOE SWU prices: ($US per SWU)			
USEC	121.50[1]	117.85[2]	117.85[2]
AFC	153.00[3]	153.00[3]	153.00[3]
Requirements	157.00[3]	157.00[3]	157.00[3]
Incentive Price (IP2)	104.67[4]	100.68[5]	100.68[5]
Calculated worth of enriched UF$_6$[6]: ($US per KgU as UF$_6$)			
2.0 w/o U^{235}	219	223	207
2.5 w/o U^{235}	306	311	285
3.0 w/o U^{235}	396	403	366
3.5 w/o U^{235}	488	496	447
4.0 w/o U^{235}	582	591	530
4.5 w/o U^{235}	677	687	614

[1] Effective 10/1/91.
[2] Effective 10/1/89 to 9/30/91.
[3] Effective since 10/1/84.
[4] Estimated IP2 for FY92: Effective 10/1/91 to 9/30/92, for up to 30% of annual requirements.
[5] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[6] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 w/o U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales[1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range[2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5223	1992-1995	301-600	See Remarks	Utility	Producer	Series of Fixed Prices
5225	1991	Less than 50	98-102	Utility	Intermediary	
5227	1991	301-600	103-110	Utility	Intermediary	
5231	1991	50-100	98-102	Producer	Intermediary	
5251	1991	301-600	90-97	Utility	Intermediary	
5253A	1992	601-1,000	See Remarks	Utility	Intermediary	Contained in EUP
5254	1991	101-300	98-102	**R**	Convertor	UF_6
5258A	1992-1994	1,001-3,000	See Remarks	Utility	Intermediary	Contained in EUP

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110,* represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Loan Rate	Borrower	Lender	Remarks
5226	1991	601-1,000	98-102	Intermediary	Utility	UF_6
5235	1991	301-600	**R**	Intermediary	Producer	

Conversion Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range [2] of Current Conversion Value	Buyer	Seller	Remarks
5229	1991	301-600	98-102	Utility	Convertor	

Enrichment Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity [3] (thousand SWU)	Price Within Percentage Range [2] of Current SWU Value [4]	Buyer	Seller	Remarks
5215	1992	Less than 50	98-102	Utility	Intermediary	
5228	1996-1998	101-300	**R**	Utility	**R**	
5230	1995-2001	601-1,000	See Remarks	**R**	Producer	Series of Fixed Prices
5232	1996-1999	**R**	See Remarks	Utility	Producer	Base Escalated
5233	1996-1999	**R**	See Remarks	Utility	Producer	Series of Fixed Prices
5234	1996-1999	**R**	**R**	Utility	Producer	
5253B	1992	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5257	1992	101-300	**R**	Utility	Intermediary	
5258B	1992-1994	101-300	See Remarks	Utility	Intermediary	Contained in EUP
5260	1993-2001	601-1,000	See Remarks	Utility	Producer	Series of Fixed Prices

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8)		Delivery Period	Remarks
	Spot or Near-term[1]	Intermediate or Long-term[2]		
Available for Sale:				
ACTIVE				
90-1227	500	—	1991	
90-1307*	330	—	1991	
91-1215*	785	—	1992	
91-1502	500	—	1991	
91-1503A*	500	3,500	1991-1993	UF_{6}e
91-1505	1,500	—	1991	
91-1506	500	—	1991	
91-1507	500	—	1991	
Total	**5,115**			
INACTIVE	**3,930**			
Available for Loan:				
ACTIVE				
91-1084	3,900	—		U_3O_8
91-1219*	260	—		U_3O_8
91-1220*	325	—		UF_6
91-1174*	2,000	—		U_3O_8
Total	**6,485**			
INACTIVE	*None reported*			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report

Active Projects reclassified as Inactive since last month: 90-1231
Active Projects removed since last month: 91-1151, 91-1510

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SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
Inquiries to Purchase:				
ACTIVE				
91-1214*	240	—	1991	
91-1229*	210	—	1991	
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1209	—	100 per year	1991-1995	U_3O_8/UF_6
91-1227A*	—	60	1992-1994	UF_{6e}
91-1197	—	2,210	1992-1997	U_3O_8/UF_6
91-1223*	—	260	1992	UF_6
Total	**450**			
INACTIVE	**810**			
Inquiries to Borrow	*No inquiries to borrow are reported*			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1201

Active Projects removed since last month: 91-1141, 91-1183, 91-1186, 91-1188A, 91-1204, 91-1208A 91-1213

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF_6)		Delivery Period	Remarks
	Within 3 Years[1]	Beyond 3 Years[1]		
Available for Sale:				
ACTIVE				
91-1202	1,650	—	1991	
91-1221*	220	—	1991	
91-1500	300	—	1991	
91-1501	400	—	1991	
Total	**2,570**			
INACTIVE	*None reported*			
Inquiries to Purchase:				
ACTIVE				
91-1170	—	1,100	1992-1996	
Total	**0**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: 91-1174, 91-1185

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SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term[1]	Quantity (Thousand SWUs) Intermediate or Long-term[2]	Delivery Period	Remarks
Available for Sale				
ACTIVE				
90-1078D*	250	—	1991	UF_6e
91-1509	200	—	1992	
91-1500	—	1,000 per year	1991 on	
Total	**450**			
INACTIVE	**935**			
Inquiries to Purchase				
ACTIVE				
91-1206	5	—	1992	UF_6e
91-1210	400	—	1991-1992	
91-1211*	15	—	1992	
91-1224*	60	—	1992	UF_6e
90-1196	—	60 per year	1995 on	
91-1027	—	55 per year	1996-2000	
91-1094B	—	385 per year	1994-1995	UF_6e
91-1142	—	75 per year	1995-2000	
91-1199	—	385 per year	1996-2000	
91-1066	—	320	1995-2000	
91-1152	—	2,700	1995-2001	
91-1171	—	560	1995-1998	
91-1218*	—	1,900	1993-2001	
91-1227B*	—	35	1992-1994	UF_6e
Total	**480**			
INACTIVE	**445**			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1508
Active Projects removed since last month: 90-1144, 90-1224B, 90-1301, 91-1105, 91-1131, 91-1136, 91-1154, 91-1155, 91-1160, 91-1179, 91-1188B, 91-1208B

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Sept. 30, 1991)**	**Last Month (Aug. 31, 1991)**	**12 Months Ago (Sept. 30, 1990)**	**This Month (Sept. 30, 1991)**	**Last Month (Aug. 31, 1991)**	**12 Months Ago (Sept. 30, 1990)**
Australia (dollar)	10.51	11.15	12.22	27.33	29.00	31.77
Belgium (franc)	287.97	314.52	324.55	748.65	817.69	843.76
Canada (dollar)	9.50	9.99	11.67	24.71	25.97	30.33
EC (ecu)	6.82	7.42	7.69	17.73	19.30	19.99
Finland (markka)	34.06	37.11	37.37	88.55	96.47	97.15
France (franc)	47.63	51.90	52.73	123.82	134.93	137.09
Germany (mark)	13.97	15.29	15.77	36.32	39.74	40.99
Italy (lira)	10,456	11,404	11,796	27,182	29,647	30,668
Japan (yen)	1,116	1,197	1,393	2,901	3,112	3,622
Netherlands (guilder)	15.75	17.21	17.77	40.95	44.75	46.20
So. Africa (comm. rand)	23.56	25.14	25.96	61.26	65.37	67.50
So. Korea (won)	6,111	6,407	7,222	15,888	16,657	18,774
Spain (peseta)	885.80	951.29	986.81	2,303	2,473	2,565
Sweden (krona)	51.00	55.45	58.01	132.59	144.16	150.82
Switzerland (franc)	12.18	13.33	13.06	31.66	34.65	33.96
Taiwan (dollar)	220.08	231.18	270.68	572.16	601.01	703.72
UK (pound)	4.80	5.21	5.37	12.47	13.54	13.97
US (dollar)	8.40	8.75	10.10	21.84	22.75	26.26

Transaction Value[1]

	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
Country (currency)	**This Month (Sept. 30, 1991)**	**Last Month (Aug. 31, 1991)**	**12 Months Ago (Sept. 30, 1990)**	**This Month (Sept. 30, 1991)**	**Last Month (Aug. 31, 1991)**	**12 Months Ago (Sept. 30, 1990)**
Australia (dollar)	10.89	11.41	13.79	28.31	29.66	35.86
Belgium (franc)	298.25	321.71	366.32	775.39	836.38	952.36
Canada (dollar)	9.84	10.22	13.17	25.59	26.56	34.23
EC (ecu)	7.06	7.59	8.68	18.37	19.74	22.56
Finland (markka)	35.28	37.96	42.18	91.72	98.68	109.66
France (franc)	49.33	53.09	59.52	128.24	138.02	154.74
Germany (mark)	14.47	15.64	17.80	37.62	40.65	46.27
Italy (lira)	10,829	11,664	13,315	28,153	30,325	34,615
Japan (yen)	1,156	1,224	1,573	3,005	3,183	4,088
Netherlands (guilder)	16.31	17.61	20.06	42.41	45.78	52.15
So. Africa (comm. rand)	24.40	25.72	29.31	63.44	66.86	76.19
So. Korea (won)	6,330	6,553	8,151	16,455	17,037	21,191
Spain (peseta)	917.43	973.04	1,114	2,385	2,530	2,896
Sweden (krona)	52.82	56.72	65.48	137.33	147.45	170.23
Switzerland (franc)	12.61	13.63	14.75	32.79	35.44	38.34
Taiwan (dollar)	227.94	236.46	305.52	592.59	614.74	794.29
UK (pound)	4.97	5.33	6.06	12.92	13.85	15.77
US (dollar)	8.70	8.95	11.40	22.62	23.27	29.64

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[1] As of May 1991 Report #273: calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6 This Month (Sept. 30, 1991)	Last Month (Aug. 31, 1991)	12 Months Ago (Sept. 30, 1990)	per kg U as UF_6 This Month (Sept. 30, 1991)	Last Month (Aug. 31, 1991)	12 Months Ago (Sept. 30, 1990)
Australia (dollar)	1.94	2.04	1.75	4.28	4.50	3.87
Belgium (franc)	53.14	57.51	46.49	117.15	126.79	102.72
Canada (dollar)	1.75	1.83	1.67	3.87	4.03	3.69
EC (ecu)	1.26	1.36	1.10	2.77	2.99	2.43
Finland (markka)	6.29	6.79	5.37	13.86	14.96	11.83
France (franc)	8.79	9.49	7.57	19.37	20.92	16.69
Germany (mark)	2.58	2.80	2.26	5.68	6.16	4.99
Italy (lira)	1,929	2,085	1,694	4,253	4,597	3,734
Japan (yen)	205.93	218.88	200.03	453.99	482.54	440.99
Netherlands (guilder)	2.91	3.15	2.55	6.41	6.94	5.63
So. Africa (comm. rand)	4.35	4.60	3.73	9.59	10.14	8.22
So. Korea (won)	1,128	1,172	1,037	2,486	2,583	2,286
Spain (peseta)	163.45	173.95	141.67	360.35	383.50	312.33
Sweden (krona)	9.41	10.14	8.33	20.75	22.35	18.36
Switzerland (franc)	2.25	2.44	1.88	4.95	5.37	4.13
Taiwan (dollar)	40.61	42.27	38.86	89.53	93.19	85.67
UK (pound)	0.89	0.95	0.77	1.95	2.10	1.70
US (dollar)	1.55	1.60	1.45	3.42	3.53	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 w/o Tails Assay This Month (Sept. 30, 1991)	Last Month (Aug. 31, 1991)	12 Months Ago (Sept. 30, 1990)	UF_6 Value per kg U as UF_6 This Month (Sept. 30, 1991)	Last Month (Aug. 31, 1991)	12 Months Ago (Sept. 30, 1990)
Australia (dollar)	83.85	85.40	60.50	31.91	33.46	35.69
Belgium (franc)	2,297	2,408	1,607	874.19	943.57	947.94
Canada (dollar)	75.81	76.49	57.75	28.85	29.97	34.07
EC (ecu)	54.40	56.85	38.06	20.71	22.27	22.45
Finland (markka)	271.68	284.14	185.00	103.40	111.32	109.15
France (franc)	379.88	397.41	261.06	144.58	155.70	154.02
Germany (mark)	111.43	117.05	78.05	42.41	45.86	46.05
Italy (lira)	83,396	87,319	58,398	31,740	34,211	34,455
Japan (yen)	8,901	9,166	6,898	3,388	3,591	4,070
Netherlands (guilder)	125.63	131.81	87.98	47.82	51.64	51.91
So. Africa (comm. rand)	187.94	192.53	128.53	71.53	75.43	75.84
So. Korea (won)	48,745	49,059	42,900	18,552	19,221	21,093
Spain (peseta)	7,065	7,284	4,885	2,689	2,854	2,882
Sweden (krona)	406.80	424.59	287.19	154.83	166.35	169.44
Switzerland (franc)	97.14	102.04	64.67	36.97	39.98	38.16
Taiwan (dollar)	1,755	1,770	1,608	668.10	693.53	790.61
UK (pound)	38.26	39.88	26.60	14.56	15.63	15.69
US (dollar)	67.00	67.00	50.00	25.50	26.25	29.50

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[1] As of May 1991 Report #273: calculated using currency exchange rates **for** the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* **on** the last business day of the month.

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RECENT DEVELOPMENTS

USCEA

USCEA URANIUM SEMINAR '91

The US Council for Energy Awareness held its annual International Uranium Seminar '91 in St. Petersburg, Florida, on September 23-25. Over 200 delegates attended and 15 papers were presented. A highlight of the conference was a panel discussion on the future of the uranium market which provided a provocative topic that both panel members and the audience enjoyed. Brief summaries of selected papers and of the panel discussion are given below.

Australia's Uranium Supply Potential and Policies: An Update

Robert G. Crick, Assistant Secretary of the Uranium and Nuclear Industry Branch of the Australian Department of Primary Industries and Energy, built upon the paper he presented at the USCEA Uranium Seminar in San Antonio last year. He confirmed that the governing Australian Labor Party has retained its policy of restricting uranium mining to the projects currently in operation. He also noted that within the past year, agreements have been reached between Australia and both Canada and the USA which will allow international obligation exchanges under Australian bilateral safeguards agreements. These agreements will permit the exchange of safeguards obligations on nuclear material in different safeguards jurisdictions, as opposed to physical shipment of the material between the jurisdictions. Mr. Crick also maintained that Australia would "remain a substantial and reliable source of uranium at commercially competitive prices".

Canada's Uranium Industry - Prospects for the Future

Mr. R. M. Williams, Director of the Uranium Division within the Electricity Branch of Canada's Department of Energy, Mines and Resources, summarized recent developments in Canada and gave a relatively optimistic view of the future. He gave an overview of production and ownership changes along with an outline of other potential production sites. According to Williams, Canadian output accounted for 30 percent of Western World uranium production, and 45 percent of Canadian uranium exports went to the USA during the period 1986 through 1990. He maintains that the potential for additional uranium discoveries, coupled with policies that favor investment in the uranium industry, will enable the Canadian uranium industry to remain competitive.

Perspectives on the US Uranium Industry

Howard L. Walton, Director of the Nuclear and Alternate Fuels Division, Energy Information Administration, Department of Energy, discussed the information compiled by the Energy Information Administration concerning the domestic uranium industry, US policies that affect the industry, and possible future trends. Several new statistics were presented, including the average price of uranium delivered from domestic suppliers to domestic utilities during 1990, which fell by about $4 from 1989, to $15.70 per pound U_3O_8. Uranium imports into the USA jumped 80 percent, to 23.7 million pounds in 1990, while US uranium production decreased 35 percent, to 8.9 million pounds.

What is a Participation?

The How, What and Why of Total and Malapai

James J. Graham, President and Chief Executive Officer of Total Minerals Corporation, discussed the acquisition of Malapai Resources Company by an EdF subsidiary and the arrangements with Total which followed. *The Why:* Total saw a need to increase its size and contract base and EdF saw a need for long-term security of supply. As EdF focused on the acquisition of Malapai, it came to realize that it needed help analyzing Malapai, so Total was asked to provide its expertise. *The How:* As EdF wanted a long-term relationship with an experienced French operator, Total seemed to be a perfect fit. From that point the relationship was defined. *What* is this participation? Total Minerals and Malapai Resources both retain full ownership of their assets, but share all costs, revenues, and liabilities. A twenty - year contract

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between EdF and Total/Malapai is also tied to the participation agreement. The agreement has assured the existence of a uranium producer through a soft market.

Changing Spots: The Transformation of a Uranium Producer

An overview of Pathfinder Mines Corporation's past, along with its future direction, was given by Robert E. Moyer, Manager of Minerals Marketing for Cogema, Inc. Mr. Moyer suggested that the company has followed a path similar to that suggested several years ago in a paper written by Tom Pool, a supply analyst for NUEXCO. In that article, Mr. Pool proposed that large open-pit and underground uranium mines would not continue to be viable in the USA because of the lack of flexibility in increasing and decreasing production. Instead, viable uranium production in the USA would be restricted to solution mines or small, high-grade underground mines. According to Moyer, all of Pathfinder's large conventional mills and large open-pit mining operations will be gone by the mid- to late 1990s. He suggested that they will be replaced by in-situ leach mines in Wyoming and possibly by small high-grade underground mines in Northern Arizona.

Brokers: The Market Confessors

Daniel R. Einbund, Vice President of New York Nuclear Corporation, gave a very animated speech on the role of brokers in the uranium market. He likened the role of the broker to that of "the curate who hears confessions in the local parish", hearing the secrets of the market players. Through a series of staged telephone calls, he illustrated the changing roles and perceptions of players in the uranium market. According to Mr. Einbund, "There really are no taboos in our industry", just misconceptions that have been accepted by the majority of market participants.

A Utility's Role in the Development of Nuclear Fuel Procurement Policy

William J. Alexander, Technical Buyer of Nuclear Fuels for Philadelphia Electric Company, discussed the difficulties involved in reaching agreement between Public Utility Commissions (PUC) and selected utilities regarding the potentially restrictive Nuclear Fuel Procurement Guidelines. In addition, he examined issues considered important by the Utility Commission and utilities. Using the PUC of the Commonwealth of Pennsylvania and the state's nuclear utilities as examples, he examined the areas of the guidelines issued by the Pennsylvania PUC that covered such controversial areas as inventory management and contract lengths. He also suggested that other state utility commissions could be expected to become more active in these areas, as uranium prices recover in future years.

Modeling Uncertainty in Uranium Supply Strategies

Kevin O'Sullivan, Senior Analyst for Pacific Gas and Electric Company, discussed the Contract Mix computer model used by a group of eleven utilities (Contract Mix Users Group) to evaluate the expected costs and risks of uranium contracting decisions. The Fortran computer program simulates least-cost acquisitions to satisfy nuclear fuel requirements. Using the program with up to seven spot-price-trend models, a utility or a producer can balance an expected purchase or sales strategy with some range of risk, as represented by contract commitment levels or production volume. Although there are limitations, Mr. O'Sullivan contends that "the process is useful as a first estimate to identify supply sources that are strong and weak in different market scenarios."

Directions for the 1990s: *Which Way is Up?*

The panel discussion on factors influencing the uranium market was the most lively of the sessions. Moderated by George White, Jr., the panel was composed of representatives from producers, utilities, and brokers. Throughout the discussion, mainly as the result of audience participation, the dominance of PUCs as a factor in utility inventory decisions was brought up. The panel appeared to accept the idea that the trend towards shorter-term contracting would continue, but that long-term options would become more common. Panel members hesitated to speculate on the effect that political and economic changes in the Soviet Union and former East Bloc countries would have on the market.

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WASHINGTON FOCUS

by Linda L. Gunter

During September, Congress increased its attention to the problems facing DOE's uranium enrichment program and continued considering legislation to restructure the program into a government corporation. On September 24, the Senate Energy & Natural Resources Committee held a hearing on the status of the Atomic Vapor Laser Isotope Separation (AVLIS) program. The Senate is reportedly preparing for a floor vote in October on the omnibus energy bill (S 1220), which includes as a separate title S 210, the uranium enrichment bill, which already passed the Senate on its own (See July 1991 Monthly Report, #275). In the House of Representatives, much of the activity was behind the scenes, as the staff of the Committees on Energy & Commerce and Interior worked on separate versions of enrichment restructuring legislation. The staff of Energy & Commerce has revised its bill, first circulated in August, and a new draft will be made public shortly. Both committees will hold hearings or mark up their bills in October.

Energy R&D Subcommittee Hearing on AVLIS

During its hearing on AVLIS, the Senate subcommittee on Energy Research & Development criticized DOE for its inability to deploy AVLIS technology after 18 years' effort and over $1 billion spent on research and development (R&D). Several key people testified at the hearing, including William Young, DOE Assistant Secretary for Nuclear Energy; Dr. James Davis, Associate Director of Lasers at Lawrence Livermore National Laboratory (LLNL); Dr. Robert Merriman, Vice President, Martin Marietta Energy Systems (MMES); and Joseph Farley, CEO of Southern Company.

Chairman Wendell Ford (D-KY) expressed disappointment about the decline in R&D funding and the delay in deployment resulting from cuts in the FY 1992 budget. He expressed his frustration at the delay, from 1997 to 2001, before a plant will be ready for operation. Young admitted that the FY 1992 budget cuts will cause a delay in AVLIS demonstration to March 1993. Dr. Davis said Congress may have intended to continue funding the program at FY 1991 levels, but in fact the FY 1992 budget cuts were harmful because of the termination of the Special Isotopic Separation (SIS) program that had provided some funding for the laser program. Mr. Farley criticized LLNL statements that FY 1992 budget cuts will cause the demonstration schedule to slip into 1993, indicating he does not think the schedule change is justified.

Sen. Ford encouraged DOE to create an alternative plan to compete in the world enrichment market if its legislative plan fails. Sen. Ford said without timely AVLIS deployment, the Japanese or the French will take advantage of the technology first. Mr. Young responded that DOE will continue to focus its efforts on enacting legislation restructuring the program into a government corporation. He reiterated administration policy that deployment of the technology and funding decisions will be left to the private sector.

Dr. Davis anticipates lower capital and power costs from AVLIS once it is built. He said "Two billion watts of energy are saved if existing GDPs are replaced by AVLIS and 20% less uranium is used to produce the same energy fuel compared to existing enrichment plants." The initial demonstration phase of laboratory testing of full-scale equipment began the week of September 24. These "life cycle tests" will continue for a year, leading to further reduction of costs, Davis claimed

Dr. Davis testified that Cooperative Research and Development Agreements (CRADAs), which allow national labs to transfer technology to the private sector, are the only legal method for companies to gain access to AVLIS technology.

Davis said that until recently, AVLIS technology had been embargoed from CRADAs. DOE's interpretation of CRADAs is different from Dr. Davis'. According to DOE, the uranium enrichment aspects of AVLIS remain classified and unavailable to the private sector. In the future however, DOE may grant waivers for companies to use AVLIS-related technology.

Utilities continue to support AVLIS deployment and continued funding of its demonstration program. In response to a question from Sen. Ford about the private sector's willingness to build AVLIS, Mr. Farley said there are currently too many uncertainties for the private sector to take the risk. These uncertainties include licensing, environmental permitting, site selection, and completing the demonstration phase of the program. He said the House's proposed solution to the program's problems would be unworkable, because if the diffusion plants were separated from AVLIS, the new company would not have the customer base or track record necessary to secure financing for AVLIS construction.

In a related issue, the National Academy of Sciences recently completed a report on alternative uses of AVLIS technology. The report was sent to DOE on September 30 and should be made public soon.

NRC Rule on Licensing Enrichment Facilities

◇ On September 16, the Nuclear Regulatory Commission (NRC) published its proposed rule that conforms its regulations on licensing uranium enrichment facilities to the law Congress passed last year. That law requires enrichment facilities to be licensed under fuel cycle regulations rather than as production facilities. The law was passed at the urging of Louisiana Energy Services (LES) in order to codify the licensing process for the enrichment plant LES plans to build in the USA. Over the past year, LES has progressed on its license application, submitting the preliminary Safety Analysis Report (SAR) and Environment Report (ER) to the NRC staff last spring. Since then, LES has responded to questions from NRC staff about the SAR. The Atomic Safety Licensing Board has scheduled a prehearing for November 14, 1991 in Louisiana to discuss the SAR and ER. A draft of the Environmental Impact Statement is scheduled to be finished by October 15, 1991, with the final draft completed and published for public comment in the *Federal Register* by March 1, 1992.

INDUSTRY BRIEFS

Pathfinder To Purchase Reno Creek

Pathfinder Mines, Inc. has reached an agreement with Union Pacific Resources (UPR) to purchase UPR's Reno Creek in-situ leach (ISL) uranium property in northeast Wyoming. The purchase of this three-million pound reserve will add to Pathfinder's portfolio of properties in Wyoming, including open-pit mines in the Gas Hills and Shirley Basin, and the recently acquired Ruth and North Butte ISL properties.

◆ ◆ ◆

Korea Plans 13 More Reactors

Korea Electric Power Corporation (KEPCO) announced that under the government's revised long-term development program, 13 new commercial power reactors are planned for construction by 2006. The new reactors are in addition to the previously announced 700-MW CANDU PHWR and two 1,000-MW PWRs, and will include five 700-MWe PHWRs and eight 1,000-PWRs. In a country where peak electricity demand has averaged a 15% growth rate annually over the last 30 years, KEPCO plans that nuclear power will generate well over half of its total electricity by 2006.

US Reactors Set New Records

On August 30, Pacific Gas & Electric's Diablo Canyon-2 broke the light water reactor operation record by running continuously for 481 days. This broke the old record of 480 days set last July by GPU Nuclear's Three Mile Island-1.

But only a few days later, the Wolf Creek nuclear power plant near Burlington, Kansas surpassed that new record, and when it shut down for scheduled maintenance on September 19, it had reset the record at 487 continuous days. Wolf Creek is owned by Kansas Gas & Electric, Kansas City Power & Light, and Kansas Electric Power Cooperative.

◆ ◆ ◆

Yankee Rowe Closed Down

The 31-year old Rowe, Massachusetts, nuclear plant owned by Yankee Atomic Electric Company was shut down voluntarily by the operators on October 1 in response to a Nuclear Regulatory Commission staff recommendation. The staff recommended that the unit be shut down pending additional analysis on how the plant would respond under certain accident scenarios. The plant has been the center of attention lately, as Yankee Rowe was the first US plant to begin preliminary operating license extension procedures. The primary reason for the staff recommendation was concern over pressure vessel embrittlement. Yankee plans to address the concerns, and hopes to restart the plant in the future and to pursue license renewal.

Sequoyah Fuels Ordered Not To Restart

On October 4, the Nuclear Regulatory Commission (NRC) issued an order to Sequoyah Fuels Corporation prohibiting the restart of its Gore, Oklahoma, uranium conversion plant. The plant will not be allowed to reopen until a plan to improve the plant's health and safety program, as well as its environmental program, is submitted to and approved by the NRC. The plant had been shut down for a two-week routine maintenance period when the order was issued.

◆ ◆ ◆

Rössing Announces Further Production Cutbacks

In mid-September, Rössing Uranium Ltd. of Namibia announced that the company's Board had approved proposals to cut production down to five million pounds U_3O_8 annually, from its current level of 6.5 million pounds. Rössing has undertaken many cost-cutting measures in an effort to continue production through the presently depressed uranium market. The company's production capacity exceeds ten million pounds U_3O_8 per year.

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WORLD ASSOCIATION OF NUCLEAR OPERATORS

Background

One of the most significant steps toward assuring the future of nuclear energy took place in May 1989, with the signing of an agreement by nearly all the world's nuclear utilities establishing the World Association of Nuclear Operators (WANO). As a result of the well-publicized nuclear accidents at Three Mile Island in 1979 and Chernobyl in 1986, public concern about the safety of nuclear power was seen as a major obstacle to the growth of the industry. To regain their support of nuclear energy, it was apparent some significant effort was required to reassure the public. Consequently, the Institute of Nuclear Power Operators (INPO) was established in the United States in 1979, and the idea of WANO was conceived in 1987.

After two years of planning, the inaugural meeting of WANO was held in Moscow, USSR, with every utility that operates a nuclear power plant worldwide attending and becoming a member. Lord (Walter) Marshall of Goring, former Chairman of the CEGB, was approved as the Chairman of the WANO Governing Board, headquartered in London, England. William Lee, CEO and then-President of Duke Power Company, was elected as WANO's first President, and Thomas Eckered was designated director of the Coordinating Center, also in London.

At the second WANO Biennial General Meeting held in Atlanta, Georgia, USA, on April 21-23, 1991, Shoh Nasu, President of Tokyo Electric Power Company, was elected the organization's second President.

During his address to the second WANO General Meeting, Lord Marshall stressed the importance of worldwide cooperation among nuclear operators:

> *Unfortunately the world nuclear community did not grasp the full meaning of the Three Mile Island accident. We analyzed TMI as an American problem and we did not recognize the need for nuclear utilities worldwide to work together. At that time we did not recognize that we, the nuclear utilities everywhere, are bound together by a simple and stark mutual interest: we all are fearful that one utility will let us down, will permit a management error and allow another nuclear accident.*
>
> *Unfortunately it took the horrific accident at Chernobyl to persuade us all of these facts. We then all realized that, taking the world as a whole, it is no good having 99 percent of the plants very safe if the other one percent have low standards. We simply cannot afford to have more accidents, anywhere, at even a small fraction of the Chernobyl scale.*
>
> *Given this interdependence, it follows that the nuclear utilities worldwide have a collective responsibility to work together and help one another to improve the safety and reliability of the plants they operate.*

Relationship to other Agencies

The concept for WANO grew from INPO, and, like INPO, it is an apolitical organization whose underlying philosophy is to encourage effective and improved communication between member utilities, so that the experience of one member benefits all members. The two organizations work closely together in complementary roles to promote excellence in and to maximize the safety and reliability of nuclear plant operations.

Headquartered in Atlanta, Georgia, USA, INPO serves the US nuclear industry as WANO serves the world nuclear community. INPO's computer and information systems are used by WANO for event reporting and data collection, and INPO's performance indicators form the basis for WANO's universal performance measurement system.

In the arena of inter-agency relationships, WANO has also developed a strong partnership with the International Atomic Energy Agency (IAEA). Since two of the three primary areas of responsibility for the IAEA are Nuclear Power and Safety, and Safeguarding Nuclear Materials and Facilities, IAEA Director General Hans Blix has supported WANO from its inception, believing that WANO would complement the experience and responsibilities of the IAEA. A Memorandum of Understanding between the two organizations was signed in June 1989, providing the route for an exchange of information. Lord Marshall summed up the

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agreement by stating that the intention is that the organizations will complement each other, not compete with each other.

This cooperation has proved highly beneficial to the nuclear power community, as IAEA deals on a governmental and regulatory level, while WANO operates on an operating utility level. WANO's charter stresses that it is not a governmental organization, and, as Lord Marshall stated, "We avoid interaction with governments to the maximum possible extent." By working together with IAEA, their efforts are bridging the gaps between governments and utilities.

Objectives

The mission of WANO is "to maximize the safety and reliability of the operations of nuclear power plants by exchanging information and encouraging communication, comparison, and emulation amongst its members." As Lord Marshall stated in his inaugural speech, "If we had had INPO at an early date, then TMI would never have happened. If we had had WANO at an early date, then Chernobyl would never have happened. It has taken those accidents to give us the commitment to work together."

To fulfill its mission, WANO has established a set of goals in which it strives to:

- Promote bilateral and multilateral exchanges and the use of operating experience information among members.
- Provide members with early notification and follow-up information on significant events at other plants.
- Screen and analyze events that occur at nuclear power plants worldwide in order to identify possible precursors of more serious events, and disseminate the lessons learned.
- Identify and promote the use of good practices among members.
- Encourage the comparison of operations and an emulation of high standards by WANO members through sponsorship of exchange visits. Encourage members to share methodologies through sponsorship of workshops and seminars.
- Collect, maintain, and apply the data on selected performance indicators to improve nuclear plant performance in areas such as nuclear plant safety and reliability, plant efficiency, and personnel safety.
- Maintain cooperative relationships with other international organizations, such as the IAEA, and work to promote safety and reliability of nuclear power plants.

Membership

Membership in WANO is entirely voluntary, as is the disclosure of information by individual members. Today, all 144 owners of the world's operating nuclear power plants have indicated their support of WANO's concept and become members of the organization.

A unique aspect of WANO's operation is that it has no regulatory authority or power to enforce recommendations or programs upon its members. WANO avoids any resemblance to a bureaucratic, regulatory body, and members view its programs solely as advice and inspiration to stimulate emulation among operators. Most utilities are in agreement that greater safety does not necessitate greater regulation, but does require a commitment by all operators to reduce risks. They realize that the long-term viability of the industry is dependent upon everyone's dedication to safety.

To avoid any political discrimination, WANO emphasizes participation of its members as *individual* members, rather than as representatives of a country or region. However, many utilities have joined WANO as a group. For example, when several European countries joined the organization as a group, it was totally acceptable, considering the worldwide acceptance of European countries as partners in the global scheme. On the other hand, if a utility were perceived as representative of a controversial country and not as an individual utility, it could be denied access to all the information and assistance it may need, possibly creating the weak link that WANO is trying to avoid.

Structure

WANO is headquartered in London, England, where Governing Board Chairman Lord Marshall and President Shoh Nasu orchestrate the international improvement in nuclear safety. As **Figure 1** illustrates, WANO has a non-centralized structure organized into a General Assembly, a Governing Board, Regional Centers, and a Coordinating Center. Each member utility can choose to associate itself with any one of the four regional centers—Moscow, Soviet Union; Atlanta, USA; Paris, France; or Tokyo, Japan.

Each regional center operates as a separate entity, with its own regional governing board, a director, and permanent

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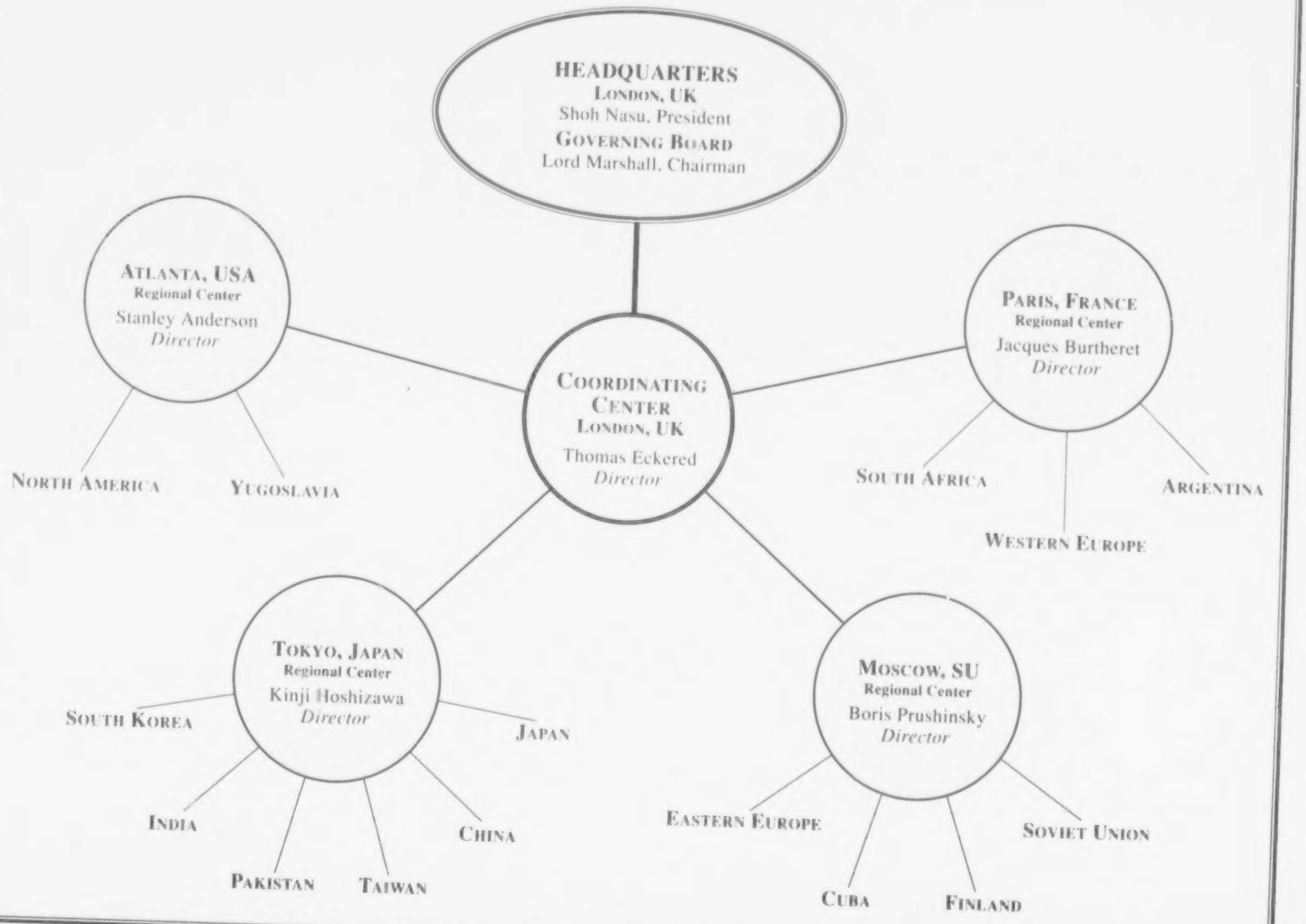
Figure 1
WANO ORGANIZATION AND LEADERSHIP


HEADQUARTERS
London, UK
Shoh Nasu, President
Governing Board
Lord Marshall, Chairman
Coordinating Center
London, UK
Thomas Eckered
Director
Atlanta, USA
Regional Center
Stanley Anderson
Director
North America
Yugoslavia
Paris, France
Regional Center
Jacques Burtheret
Director
South Africa
Western Europe
Argentina
Tokyo, Japan
Regional Center
Kinji Hoshizawa
Director
South Korea
India
Pakistan
Taiwan
China
Japan
Moscow, SU
Regional Center
Boris Prushinsky
Director
Eastern Europe
Cuba
Finland
Soviet Union

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staff. Staff at each center range from five to twenty permanent personnel, plus various loaned experts. The regional centers are responsible for most WANO activities and concentrate on development of activities characteristic of the region.

The Coordinating Center in London, United Kingdom, coordinates the activities of the regional centers, and also provides administrative support to the Governing Board and the membership. The Coordinating Center employs approximately ten people.

WANO is regulated by a Governing Board composed of members from each region. The Board meets three times a year, with the directors of the Regional Centers and the Coordinating Center attending as observers. The General Assembly is the forum for all members, representing over 400 nuclear power plants. It meets every two years, at which time a new president of WANO is elected. Its next meeting is scheduled for April 18-20, 1993 in Tokyo, Japan.

Major Programs

In 1989, Lord Marshall stressed that, while WANO is not involved in public relations or media endorsement of nuclear power, it is working to reduce the public's concerns about nuclear safety. To accomplish this, the organization has instituted numerous programs to improve the operational safety of the plants. These programs, described below, should result in improved safety performance and, thus, reassure the public that the world's utilities can properly manage nuclear energy.

Technical Exchange Visits and Seminars

The emphasis of the Exchange Visit Program is to facilitate the interaction of those persons from different operating companies who are directly involved in nuclear plant operations, such as plant managers and operating staff, who could best benefit from the development of open communication channels. As Eiji Takeuchi, General Manager of Nuclear Operations for Japan's Chubu Electric Power Company, stated in his address to the Atlanta conference:

> *... participation in the Exchange Visit Program is important because it exposes the participants to other methods and operational styles which may enhance the effectiveness of the participants' own management systems or techniques.*

Other conference speakers representing several countries and utilities echoed these sentiments and supported them with specific examples of operational enhancements. Eduardo Diaz Rio, Board Member of Spain's Union Electrica, described the benefit of staff exchanges between the Trillo (Spain), Gösgen (Switzerland) and Grohnde (Germany) pressurized water reactors (all of which use Kraftwerk Union technology):

> *These visits between plants of similar design have made it possible for the people responsible for the same areas in either installation to interface directly, allowing the solutions adopted to address similar problems...and better knowledge to be gained of the criteria to be taken into account for optimization of plant organization and operation.*

One of the initial priorities of the Exchange Visit Program, as outlined at the 1989 inaugural meeting, was to orchestrate a program of East-West exchange visits between the staff of nuclear plants. This goal has been realized to the extent that, by the end of 1990, every nuclear power plant in eastern Europe and the USSR had completed visits to the West and had received visits from the West. Each side is seeing merits and deficiencies in how the other operates. The intent of these exchange visits is not to impose Western methodologies on the East, but rather, to exchange information, practices, and procedures that improve safety.

Another type of exchange is through seminars where various experts can share and exchange their experiences and ideas on specific topics. The regional centers often arrange these seminars on the special topics of the region.

Performance Indicators

This program has been initiated to supply a quantitative indication of nuclear plant efficiency and reliability, as well as plant and personnel safety. The prime use of the indicators (described on next page) is to create a tool to enable plant management to monitor performance and progress, and thereby increase the safety and reliability of plant operations.

A great effort has been made to create a non-competitive system. This was done to avoid tempting the operating staff to compromise some facet of plant safety in an effort to improve plant performance, and thus improve an indicator "score".

All performance indicator data will be published annually and then distributed only to WANO members. Performance indicator data associated with specific nuclear plants are considered confidential, and release of data is prohibited without written authorization from the operating organization concerned.

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Performance Indicators

unit capability factor • unplanned capability loss factor • unplanned automatic scrams per 7,000 hours critical
safety system performance • thermal performance • fuel reliability • collective radiation exposure
volume of solid, low-level radioactive waste • chemistry index • industrial safety lost-time accident rate

The following principles for the performance indicators have been established.

- The most appropriate use of performance indicators by nuclear operating organizations is to establish performance trends, and subsequently, to shift priorities and resources as each organization deems appropriate to achieve its own desired balance among the performance indicators.
- Performance indicators should be included with other performance assessment tools and not relied upon as the sole basis for organizational decisions.
- Detail or process-related indicators should only be used by plant personnel having a detailed knowledge in the specific area the indicator is concerned with, thereby offering the staff added perspective. Organizations outside this staff should not use these particular indicators for plant comparisons.
- Performance indicators should not be used for ranking plants, since the indicators focus on limited areas of plant operations, and therefore do not create a source for judging the proper balance of all aspects of safe and reliable plant operation.

Thomas Eckered lauded the progress of this program in his address to the Atlanta convention, stating that 95 percent of the nuclear stations worldwide have begun reporting the WANO performance indicator data. However, since not all reporting stations have provided data on all ten indicators, the database is not complete.

Event Reporting and Analysis

To further facilitate the exchange of information among utilities, and to identify the potential causes of accidents, WANO has established programs for Event Notification Reports and Event Analysis Reports. Event Notification Reports (ENR) on significant events are issued to members by the regional center no more than five days after the event. WANO considers ENRs to be effective only if the ENRs are complete, confidential, and timely, as well as available for future reference. WANO demonstrated this timeliness philosophy in October 1989 when the initial ENR on Spain's Vandellos 1 fire was issued only six hours after the event.

The Event Analysis Report (EAR) provides a thorough description of the causes and consequences of an event, as well as corrective actions. The goal for the EAR is that it will be distributed within 12 weeks of the event. That period of time allows the members to analyze and comment on the ENRs they have received concerning the event. When there are recurring significant events, an Event Topic Report may be issued. All reports are for the use of members only, and are not written for, nor distributed to, the public.

Direct contact between members is crucial to WANO's event reporting and analysis. The WANO data network, currently using the INPO computer system in Atlanta, is one of the first occurrences of real-time, on-line communications between the East and West. The WANO Moscow Center has the only private data communications line in the Soviet Union that goes directly to the West without going through a government office. Up to now, the flow of information has been primarily from West to East as the Soviet system was not oriented to writing and updating procedures. Soviet operators were required to carry most of the operational knowledge in their heads, and therefore have been amazed at the extent of documentation common to Western plants.

Good Practices

The Good Practices program identifies procedures that qualify as good practices and are appropriate for members to exchange. Such a task is not made easy by the numerous technical, licensing, cultural, and management variations between different plants, and between different countries.

Staff Exchanges

The exchange of plant staff, for limited periods and within a region, is done to encourage and provide "cross-fertilization" of different approaches to operational safety.

Area Experts

Each Regional Center encourages and assists in the formation of small groups of experts in specific areas, and maintains lists of recognized experts.

Peer Review System

WANO is striving to expand its sphere of influence and its effectiveness by planning for the implementation of a peer review system. Although details have yet to be resolved, such a review system is likely to closely approximate, on a worldwide level, the INPO peer review system that is currently utilized in the USA. Under the INPO system, industry experts are loaned to INPO by their utilities for the purpose of evaluating plant performance and to make recommendations that would enhance plant operations.

At the Atlanta conference, outgoing WANO President William Lee cited the example of INPO's effectiveness with performance reviews, stating the only way for WANO to achieve the desired results in this arena is for members to volunteer for focused peer reviews, thus allowing the development of a set of universal performance criteria.

The major obstacle to such a system on a worldwide level is overcoming the cultural diversity present in the nuclear community. Quite commonly, individual operators tend to be protective and reluctant to accept any approach that is perceived as relinquishing any control.

Special VVER Project

In 1990, a special project was established to offer practical assistance to utilities in Eastern Europe and the Soviet Union for the improvement of VVER 440, Model 230, nuclear reactors. This model is the earliest production reactor the Soviet Union produced, and lags behind current world standards for safety systems. WANO suggests what retrofits are required and the order of priority for their installation. The main responsibility for this project is vested in the Paris and Moscow regional centers. The project has been quite successful, providing specific steps to improve all first-generation VVERs. For example, two expert groups are working together to finalize the backfit program, and should complete the program by the end of 1991.

In a parallel effort, an IAEA Operational Safety and Review Team (OSART) evaluated Bulgaria's Kozloduy station, containing four, first-generation 440-MWe VVERs, and because of some severe safety concerns, recommended that the station no longer continue operation. Even prior to the release of the OSART report, it was known that Bulgaria's reactors were in need of significant operational and safety upgrades, and a consortium of western European countries already had agreed to provide US$13 million in assistance to bring the Kozloduy station up to world safety standards. One reactor already has been shut down for safety upgrades and a second will be shut down in October. WANO, working with the IAEA and the European consortium, will coordinate the safety improvement efforts in Bulgaria. This effort exemplifies WANO's commitment to cooperating with many organizations to achieve their mutual goals of global nuclear safety.

Conclusion

WANO's goals can be fully achieved only if all nuclear plant operators worldwide can obtain the benefits of WANO's programs. WANO strives to maximize the sharing of information among its members, regardless of geographical location or political affiliation, thereby never allowing the lack of such information to compromise an operator's ability to prevent a serious event.

James Watkins, US Secretary of Energy, stated in his address to the WANO Atlanta conference,

> *The WANO mission remains the essential ingredient to nuclear power's prospectus... You have it within your ability to secure the nuclear power option for the future, or—by your failure to educate the public, to operate safely, and thereby inspire public confidence—you could, unfortunately, let the nuclear option slip away...[WANO is] a monumental step in the right direction... Through this fine organization, it's clear that safety in the nuclear work place has achieved the level of worldwide attention that it demands, and that our future requires. But in my opinion, we only have a few more years to prove to the world that nuclear power is still needed, that we know what we're doing to manage this technology safely, and that we can inculcate sufficient scientific literacy into our citizenry so that they themselves can separate scientific fact from the fiction of political hype which has become the most elusive threat to this vital source of world energy.*

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HISTORICAL GOVERNMENT STATISTICS

Each month for more than ten years, NUEXCO has published selected statistics released by the governments of Australia, Canada, South Africa, and the United States. The following tables are provided as a convenient reference to our readers and give complete historical data by month of most of our regularly printed government statistics. As governments often revise statistics and change the base year for an index, all the data have been updated since we last published the complete tables (Monthly Report #233 and #236), and all indices have been adjusted to reflect any changes of base year.

The tables show an average for each year. Due to independent rounding, the monthly figures may not equate exactly to the published average. The sources for all the data are given in the footnotes to the tables published in the Government Statistics section of each Monthly Report.

AUSTRALIA

PRICE INDEX OF MATERIALS USE IN MANUFACTURING – All Groups (1984/1985=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	24.8	24.3	23.9	23.8	23.5	23.6
1969	24.5	23.8	24.2	24.3	24.6	24.4	24.5	24.9	24.9	24.8	24.5	24.5	24.6
1970	24.5	24.6	24.7	24.9	25.1	25.0	24.8	24.7	24.2	24.1	23.9	23.7	23.9
1971	24.5	23.9	24.1	24.2	24.3	24.4	24.6	25.1	25.2	24.9	24.7	24.4	24.3
1972	25.5	24.5	24.8	24.8	24.6	24.9	24.9	25.7	26.3	26.4	26.3	26.3	26.3
1973	30.0	26.4	28.5	29.7	29.2	29.4	29.7	30.4	31.4	31.4	31.1	31.4	32.0
1974	34.3	32.6	33.7	33.7	34.4	34.5	33.8	35.2	35.3	34.0	34.5	34.5	34.9
1975	36.3	34.9	34.9	35.2	35.9	35.8	35.4	35.9	36.5	37.3	37.9	37.9	38.1
1976	40.7	38.8	38.9	39.0	39.1	39.5	40.4	41.2	42.0	42.2	42.2	41.4	43.2
1977	46.4	44.3	45.2	46.1	46.6	46.6	46.8	46.7	46.9	47.1	46.8	46.2	47.0
1978	52.0	47.7	48.6	48.4	49.1	49.4	51.2	52.3	53.5	55.1	55.6	56.1	56.9
1979	69.5	59.5	61.1	63.7	66.1	69.6	71.2	72.0	70.8	73.0	74.7	74.9	77.1
1980	83.1	82.1	83.4	82.1	79.3	81.0	81.8	84.0	85.0	84.6	84.1	84.6	84.9
1981	85.9	86.4	86.1	85.7	85.6	85.3	87.0	86.4	87.1	86.5	85.1	84.8	84.5
1982	89.0	85.7	85.8	87.0	88.9	88.9	88.8	89.3	89.9	90.6	91.4	90.7	90.5
1983	96.9	93.1	93.5	95.9	98.3	100.1	100.3	98.6	97.3	97.3	96.0	95.5	96.4
1984	98.0	96.4	97.2	97.5	97.6	97.5	97.7	98.6	99.7	99.4	98.6	98.3	98.0
1985	107.3	98.8	100.4	104.0	106.6	109.7	110.8	110.8	110.2	108.7	108.4	109.4	109.9
1986	101.5	109.5	108.7	99.4	94.2	93.5	95.6	97.8	97.9	105.4	105.9	104.9	105.2
1987	108.9	106.2	108.9	108.4	108.3	108.1	108.1	108.7	110.5	109.3	108.6	110.0	111.9
1988	111.8	112.4	112.3	112.3	112.4	114.1	114.0	111.9	112.1	112.8	110.4	109.1	108.3
1989	117.0	110.6	111.2	114.9	117.5	118.6	119.9	120.1	119.2	117.7	117.8	118.0	118.2
1990	123.4	119.2	120.8	121.5	119.9	118.9	116.6	116.4	122.4	128.2	134.1	133.7	128.8

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AUSTRALIA *(continued)*

CONSUMER PRICE INDEX (1980/1981=100) – for the quarter ending:

Year	Average	Mar	June	Sept	Dec
1967	32.4	31.9	32.2	32.7	32.8
1968	33.3	32.9	33.2	33.3	33.6
1969	34.2	33.9	34.1	34.3	34.6
1970	35.6	34.9	35.4	35.6	36.3
1971	37.7	36.7	37.3	38.0	38.9
1972	39.9	39.3	39.6	40.2	40.6
1971	43.7	41.5	42.9	44.4	46.0
1974	50.3	47.1	49.1	51.6	53.3
1975	57.9	55.4	57.4	57.8	61.0
1976	65.7	62.8	64.4	65.9	69.8
1977	73.8	71.4	73.1	74.5	76.3
1978	79.7	77.3	78.8	80.4	82.2

Year	Average	Mar	June	Sept	Dec
1979	86.9	83.6	85.8	87.8	90.4
1980	95.8	92.4	95.0	96.8	98.8
1981	105.0	101.1	103.4	105.5	109.9
1982	116.7	111.8	114.5	118.5	122.0
1983	128.5	124.7	127.3	129.4	132.5
1984	133.6	132.0	132.3	134.0	135.9
1985	142.6	137.8	141.1	144.2	147.1
1986	155.5	150.5	153.0	157.0	161.5
1987	168.7	164.7	167.2	170.0	172.9
1988	180.9	176.0	179.0	182.4	186.2
1989	194.6	188.0	192.6	197.0	200.7
1990	208.7	204.1	207.4	208.9	214.5

AWARD RATES OF PAY INDEXES–Adult Males In Mining, Wage Earners Weekly Rates (June 1985=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	15.8	15.6	15.6	15.6	15.7	15.7	15.7	16.0	16.0	16.0	16.0	16.1	16.1
1968	16.7	16.1	16.2	16.2	16.2	16.7	16.8	16.8	16.8	16.9	17.4	17.3	17.4
1969	17.6	17.4	17.4	17.4	17.5	17.5	17.5	17.6	17.6	17.6	17.7	17.7	18.1
1970	18.4	18.2	18.2	18.3	18.3	18.3	18.3	18.3	18.4	18.3	18.6	18.7	18.7
1971	20.3	19.6	19.6	19.6	19.8	19.9	20.0	20.1	20.2	20.9	21.0	21.1	21.2
1972	21.8	21.1	21.1	21.2	21.3	22.0	22.1	22.2	22.1	22.2	22.2	22.3	22.0
1973	24.3	22.5	23.3	23.2	23.3	24.4	24.6	24.7	24.9	25.0	25.1	25.1	25.2
1974	33.2	25.3	26.2	30.6	31.2	34.2	34.4	34.7	34.5	36.0	36.4	36.7	37.7
1975	40.6	37.5	37.7	37.8	37.9	39.4	39.3	39.2	39.2	44.5	44.8	44.8	44.8
1976	49.3	45.1	48.0	48.0	48.0	49.2	49.4	49.5	50.4	50.5	50.4	51.4	51.5
1977	54.7	51.7	52.3	53.8	53.9	55.0	54.9	55.0	55.9	55.9	55.9	55.9	56.7
1978	58.2	56.8	57.7	57.7	57.6	57.5	58.2	58.2	58.2	58.3	58.4	58.4	61.0
1979	63.2	61.2	61.2	61.5	61.7	62.0	64.0	64.1	64.4	64.6	64.5	64.4	64.9
1980	69.6	68.5	68.4	68.4	68.5	68.5	68.3	70.7	70.4	70.4	70.7	70.8	71.1
1981	76.1	73.8	73.7	73.6	73.5	76.1	76.3	76.4	76.5	76.5	76.7	77.7	82.7
1982	86.4	83.6	84.5	84.7	84.7	84.9	85.6	87.5	88.0	88.1	88.1	88.2	88.7
1983	89.9	88.7	88.8	88.8	89.0	89.0	89.0	88.9	88.9	88.8	92.8	92.8	92.7
1984	96.0	92.8	92.7	92.6	96.5	97.0	97.2	97.2	97.2	97.2	97.2	97.5	97.5
1985	100.1	97.5	97.7	97.7	100.2	100.0	100.0	100.0	100.0	100.0	100.0	103.8	103.8
1986	104.9	103.7	103.7	103.7	103.7	103.7	103.7	106.1	106.1	106.1	106.1	106.1	106.1
1987	112.9	110.6	110.6	113.0	113.0	113.0	113.1	113.1	113.2	113.5	113.7	113.7	114.0
1988	115.4	112.6	114.5	114.5	114.5	114.5	114.5	114.8	115.7	116.9	117.3	117.3	117.5
1989	126.0	123.3	123.4	125.0	125.4	125.6	125.8	126.9	127.0	127.1	127.3	127.7	128.0
1990	129.6	128.3	128.3	128.7	129.0	129.2	129.8	129.9	130.0	130.2	130.4	130.4	130.6

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HISTORICAL GOVERNMENT STATISTICS

CANADA

INDUSTRIAL PRODUCTS PRICE INDEX: All Commodities (1986=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	27.8	27.5	27.6	27.7	27.7	27.8	27.8	27.8	27.8	27.8	27.8	27.8	28.0
1968	28.3	28.1	28.2	28.3	28.2	28.2	28.3	28.3	28.3	28.4	28.4	28.5	28.7
1969	29.4	28.9	29.1	29.3	29.3	29.4	29.5	29.4	29.4	29.5	29.5	29.6	29.8
1970	30.1	30.1	30.2	30.3	30.3	30.3	30.1	30.0	29.9	29.9	30.0	30.0	30.0
1971	30.7	30.2	30.3	30.4	30.6	30.6	30.7	30.9	30.9	30.9	30.9	30.9	31.1
1972	32.1	31.4	31.5	31.7	31.9	31.9	31.9	32.1	32.1	32.3	32.4	32.6	32.9
1973	35.6	33.4	33.7	34.2	34.5	35.0	35.3	35.8	36.9	36.8	37.0	37.2	37.7
1974	42.4	39.0	39.6	40.2	41.1	41.6	42.0	42.9	43.6	43.9	44.5	45.2	45.2
1975	47.2	45.5	46.1	46.1	46.5	46.9	46.9	47.2	47.7	48.0	48.3	48.3	48.4
1976	49.6	48.3	48.7	48.9	49.1	49.4	49.6	49.7	49.8	50.2	50.2	50.3	50.8
1977	53.5	51.4	51.8	52.5	53.1	53.4	53.4	53.8	53.9	54.3	54.6	54.8	55.0
1978	58.4	55.7	56.1	56.6	57.4	57.7	58.0	58.4	58.9	59.5	60.7	61.0	61.2
1979	66.9	62.9	64.0	64.6	65.3	65.9	66.3	67.1	67.6	68.6	69.8	70.1	70.7
1980	75.9	73.4	73.9	73.5	74.0	74.4	74.8	75.6	76.6	77.3	78.6	79.2	79.3
1981	83.6	80.4	80.9	81.4	82.2	82.9	83.7	84.3	84.9	85.1	85.9	85.7	86.0
1982	89.0	86.7	87.3	87.9	88.5	89.0	89.5	89.6	89.5	90.1	90.2	89.9	90.1
1983	92.1	90.1	90.1	91.0	91.5	91.8	92.5	92.8	93.0	92.9	93.2	93.1	93.6
1984	96.3	94.5	94.8	95.6	96.1	96.1	96.2	97.1	97.0	96.9	96.9	97.2	97.5
1985	99.0	98.1	98.2	98.8	98.7	99.0	99.0	99.0	98.8	99.0	99.3	99.6	100.1
1986	100.0	100.2	100.0	99.8	99.7	99.1	99.3	99.5	100.0	100.2	[illegible]	100.8	100.6
1987	102.8	101.1	100.8	100.8	101.5	102.3	102.6	103.1	103.6	103.8	104.1	104.7	105.0
1988	107.2	105.9	105.5	105.8	106.3	106.8	107.1	107.6	108.0	108.0	108.1	108.8	108.8
1989	109.4	109.5	109.4	109.9	109.8	109.8	109.9	109.7	109.5	109.2	109.0	108.8	108.5
1990	109.7	108.7	109.5	109.3	109.1	109.6	109.4	109.1	109.3	110.2	110.6	110.9	111.0

CONSUMER PRICE INDEX: All Items (1986=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	27.6	27.0	27.0	27.1	27.3	27.4	27.6	27.8	27.9	27.9	27.9	27.9	28.1
1968	28.7	28.2	28.2	28.3	28.5	28.5	28.6	28.8	28.9	28.9	29.0	29.2	29.2
1969	30.0	29.3	29.3	29.5	29.8	[illegible]	30.1	30.2	30.3	[illegible]	30.3	30.4	30.6
1970	31.0	30.7	30.7	30.8	31.0	31.0	31.0	31.2	31.1	[illegible]	31.1	31.1	31.0
1971	31.9	31.1	31.3	31.3	31.6	31.7	31.8	32.0	32.3	32.2	32.3	32.3	32.6
1972	33.4	32.7	32.8	32.9	33.0	33.1	33.1	33.5	33.8	33.9	33.9	34.0	34.2
1973	36.0	34.5	34.7	34.8	35.2	35.4	35.8	36.1	36.6	36.8	36.9	37.2	37.4
1974	39.9	37.7	38.1	38.4	38.7	39.4	39.9	40.1	40.6	40.8	41.2	41.6	42.0
1975	44.2	42.2	42.5	42.7	43.0	43.4	44.0	44.6	45.0	45.1	45.5	45.9	46.0
1976	47.5	46.2	46.5	46.6	46.8	47.2	47.4	47.6	47.8	48.0	48.3	48.5	48.7
1977	51.3	49.1	49.5	50.1	50.4	50.8	51.1	51.6	51.8	52.1	52.6	52.9	53.3
1978	55.9	53.5	53.9	54.5	54.6	55.4	55.8	56.6	56.7	56.6	57.2	57.6	57.8
1979	61.0	58.2	58.8	59.5	59.9	60.5	60.8	61.3	61.5	62.0	62.5	63.1	63.4
1980	67.2	63.8	64.4	65.0	65.4	66.2	66.9	67.4	68.1	68.7	69.3	70.2	70.5
1981	75.5	71.5	72.2	73.1	73.7	74.3	75.5	76.1	76.7	77.3	78.0	78.7	79.1
1982	83.7	79.6	80.6	81.6	82.0	83.2	84.0	84.4	84.8	85.3	85.8	86.4	86.4
1983	88.5	86.2	86.6	87.5	87.5	87.7	88.7	89.0	89.5	89.5	90.0	90.0	90.3
1984	92.4	90.8	91.3	91.5	91.8	91.9	92.3	92.8	92.8	92.9	93.1	93.7	93.7
1985	96.0	94.1	94.7	94.9	95.3	95.5	96.1	96.4	96.5	96.7	97.0	97.4	97.8
1986	100.0	98.3	98.6	98.9	99.0	99.5	99.6	100.4	100.7	100.7	101.2	101.7	101.9
1987	104.4	102.1	102.6	103.0	103.5	104.1	104.4	105.1	105.2	105.2	105.6	106.0	106.1
1988	108.6	106.3	106.7	107.3	107.6	108.3	108.5	109.1	109.4	109.5	110.0	110.3	110.3
1989	114.0	110.9	111.6	112.2	112.5	113.7	114.3	115.0	115.1	115.3	115.7	116.1	116.0
1990	119.4	116.9	117.6	118.0	118.1	118.7	119.2	119.8	119.8	120.2	121.2	121.9	121.8

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CANADA *(continued)*

WAGE-EARNER DATA: AVERAGE HOURLY EARNINGS (C$)–Uranium Mines (SIC 057)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1983	[illegible]		–.–	16.80	16.84	17.03	17.03	16.49	16.94	17.67	17.74	17.83	17.85
1984	17.89	[illegible]	17.79	18.06	18.07	18.49	18.09	17.82	17.25	17.69	17.65	18.05	17.96
1985	18.53	18.06	18.79	18.25	18.64	19.42	18.50	18.15	17.08	18.54	18.75	19.06	19.08
1986	19.38	18.16	19.53	19.05	19.39	19.55	19.81	19.52	18.40	19.33	19.98	20.12	19.68
1987	20.12	19.53	20.33	20.04	20.47	20.50	20.23	19.75	19.64	19.85	20.06	20.47	20.62
1988	20.91	20.70	20.94	20.55	20.03	20.92	21.04	20.94	20.38	20.88	21.39	21.51	21.69
1989	21.97	21.22	22.05	[illegible]	22.37	21.89	21.89	21.67	20.97	21.97	22.26	22.60	22.80
1990	22.90	21.88	22.51	22.52	23.17	23.28	21.85	20.92	23.88	24.41	23.11	23.38	23.90

WAGE-EARNER DATA: AVERAGE HOURLY EARNINGS (C$)–Metal Mines (SIC 051-059)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1983	14.86	–.–	–.–	14.93	14.49	14.59	14.69	14.44	14.45	14.99	15.37	15.39	15.21
1984	15.85	15.37	15.69	15.62	15.93	15.74	15.58	15.82	15.46	16.06	16.25	16.23	16.49
1985	16.47	16.23	16.51	16.31	16.54	16.61	16.30	16.37	16.13	16.65	16.61	16.76	16.67
1986	16.70	16.32	16.67	16.75	16.79	16.79	16.73	16.44	16.27	16.72	16.92	17.12	16.90
1987	17.15	16.93	17.20	17.14	17.38	17.12	16.94	16.73	16.98	17.20	17.31	17.50	17.31
1988	18.51	17.54	17.97	17.88	18.50	18.21	18.31	18.45	18.21	18.73	19.32	19.61	19.36
1989	20.02	19.45	19.51	19.65	19.80	20.02	20.02	19.60	19.76	20.61	20.71	20.64	20.50
1990	20.93	20.39	20.63	20.75	21.20	20.55	20.63	20.18	20.51	21.19	21.39	21.83	21.89

WAGE-EARNER DATA: AVERAGE HOURLY EARNINGS (C$)–Mines, Quarries, and Oil Wells (SIC 051-099)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1983	14.18	–.–	–.–	14.20	14.03	[illegible]	13.97	13.84	13.80	14.31	14.55	14.57	14.56
1984	14.97	14.64	14.80	14.72	15.00	[illegible]	[illegible]	14.82	14.82	15.24	15.16	15.33	15.49
1985	15.56	15.49	15.49	15.46	15.69	[illegible]	[illegible]	15.31	15.20	15.61	15.59	15.77	15.90
1986	15.76	[illegible]	15.88	15.82	15.84	[illegible]	15.53	15.37	15.35	15.67	16.00	16.13	16.08
1987	16.11	[illegible]	16.21	16.15	16.26	15.96	15.70	15.63	15.87	16.25	16.33	16.50	16.37
1988	16.95	[illegible]	17.07	16.78	15.92	17.03	16.95	16.85	16.68	16.91	17.31	17.65	17.65
1989	18.41	[illegible]	18.26	18.35	18.40	18.17	18.17	17.96	18.24	18.73	18.74	18.78	18.93
1990	19.12	19.03	19.14	19.17	19.46	19.01	18.96	18.66	18.59	18.94	19.12	19.48	19.88

WAGE-EARNER DATA: AVERAGE HOURLY EARNINGS (C$)–Metal Rolling, Casting and Extruding (SIC 298)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1983	10.67	–.–	–.–	10.12	10.69	10.40	10.42	10.41	10.67	10.93	10.62	11.25	11.22
1984	11.11	11.48	11.46	11.48	10.95	10.76	11.01	10.78	10.95	11.14	11.20	11.13	11.01
1985	11.85	11.44	11.70	11.62	11.89	11.91	11.80	11.83	11.98	12.06	12.21	11.99	11.74
1986	12.28	12.16	12.27	12.27	12.33	12.41	12.56	12.42	11.98	12.12	12.27	12.35	12.25
1987	12.58	12.58	12.66	12.58	11.99	12.44	12.77	12.52	12.65	12.57	13.01	12.63	12.54
1988	13.17	12.82	13.01	13.10	13.32	13.02	13.03	12.93	13.25	13.44	13.46	13.41	13.22
1989	13.71	13.75	13.79	13.62	13.57	13.76	13.76	13.57	13.52	13.68	13.99	13.93	13.62
1990	14.62	13.99	14.49	14.99	14.83	14.71	14.69	14.34	14.50	14.48	14.78	14.93	14.70

WAGE-EARNER DATA: AVERAGE HOURLY EARNINGS (C$)–Chemicals and Chemical Products Industries (SIC 372-379)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1983	11.09	–.–	–.–	10.91	10.94	10.89	10.97	10.96	11.11	11.21	11.22	11.30	11.43
1984	11.68	11.61	11.43	11.50	11.55	11.57	11.60	11.74	11.70	11.82	11.88	11.88	11.91
1985	12.12	11.96	11.98	11.94	11.96	12.07	12.06	12.05	12.11	12.18	12.24	12.40	12.50
1986	12.58	12.43	12.36	12.45	12.45	12.42	12.40	12.43	12.61	12.81	12.85	12.84	12.90
1987	13.20	12.89	13.11	13.02	13.27	13.19	12.88	12.98	13.03	13.40	13.37	13.53	13.75
1988	13.77	13.73	13.69	13.62	13.66	13.58	13.76	13.73	13.71	14.05	13.90	13.91	13.92
1989	14.16	13.82	13.89	14.10	14.16	14.27	13.22	12.98	14.30	14.83	14.77	14.75	14.77
1990	15.28	14.78	15.03	15.07	14.93	15.06	15.05	15.20	15.33	15.63	15.59	15.73	16.01

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HISTORICAL GOVERNMENT STATISTICS

SOUTH AFRICA

AVERAGE DECLARED WORKING COSTS per Metric Tons of Gold Ore Milled (Rand)—For the quarter ending

Year	Average	Mar	June	Sept	Dec	Year	Average	Mar	June	Sept	Dec
1967	6.2	6.1	6.2	6.2	6.2	1979	30.16	28.60	29.44	30.71	31.89
1968	6.3	6.2	6.2	6.3	6.4	1980	35.50	33.65	34.48	36.19	37.69
1969	6.4	6.4	6.4	6.4	6.5	1981	41.87	39.26	40.41	43.28	44.52
1970	7.34	7.28	7.32	7.34	7.43	1982	47.23	45.49	45.77	48.04	49.61
1971	7.88	7.65	7.84	7.91	8.12	1983	51.88	50.35	50.51	52.92	53.70
1972	8.79	8.49	8.66	8.83	9.17	1984	58.95	55.30	56.95	60.64	62.92
1973	10.50	9.39	10.29	10.95	11.36	1985	68.70	64.48	67.42	70.47	72.43
1974	13.18	11.98	12.60	13.73	14.41	1986	80.18	75.76	77.65	81.94	85.38
1975	16.70	15.64	16.40	17.05	17.69	1987	95.01	88.17	90.74	100.79	100.34
1976	19.30	18.51	19.06	19.39	20.25	1988	106.69	102.90	103.59	109.27	110.98
1977	23.86	23.02	23.19	23.85	25.37	1989	116.65	112.29	113.76	119.76	120.79
1978	27.13	26.70	26.19	27.41	28.23	1990	129.37	126.74	128.25	129.46	133.02

TONNAGE-WEIGHTED INDEX OF WORKING COSTS per Metric Tons of Gold Ore Milled (March 1982=100)
For the quarter ending

Year	Average	Mar	June	Sept	Dec	Year	Average	Mar	June	Sept	Dec
1982	103.9	100.0	100.5	[illegible]	109.2	1987	223.1	197.1	203.5	224.7	267.0
1983	115.0	111.2	111.9	[illegible]	119.6	1988	241.1	232.4	234.0	246.5	251.4
1984	130.3	123.1	126.2	133.2	138.6	1989	273.0	262.8	267.0	280.2	282.0
1985	151.7	142.4	148.9	155.3	160.1	1990	305.3	296.3	299.9	312.6	312.4
1986	177.9	167.8	172.0	181.8	189.9						

CONSUMER PRICE INDEX (1985=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	17.0	16.8	16.8	16.9	16.9	17.0	17.6	17.1	17.2	17.2	17.1	17.1	17.1
1968	17.3	17.1	17.1	17.2	17.2	17.2	17.2	17.3	17.4	17.4	17.4	17.5	17.5
1969	17.8	17.5	17.5	17.7	17.7	17.8	17.8	17.8	17.8	17.8	18.1	18.2	18.2
1970	18.8	18.2	18.3	18.4	18.7	18.7	18.8	18.8	18.9	19.0	19.1	19.1	19.1
1971	19.9	19.2	19.2	19.4	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.5
1972	21.2	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.4	21.7	21.8	21.8	22.0
1973	23.2	22.2	22.4	[illegible]	22.8	23.0	23.1	23.3	23.4	23.6	23.8	24.0	24.1
1974	25.9	24.2	24.5	24.9	25.0	25.2	25.6	26.0	26.4	26.8	27.1	27.3	27.5
1975	29.4	27.9	28.1	28.3	28.7	28.9	29.3	29.6	29.9	30.1	30.4	30.6	30.8
1976	32.6	31.0	31.2	31.6	31.9	32.2	32.6	32.8	33.2	33.5	33.7	33.8	34.1
1977	36.3	34.4	34.9	35.3	35.6	35.8	36.1	36.5	37.0	37.3	37.5	37.7	37.9
1978	40.3	38.3	38.6	38.7	39.1	39.3	39.4	41.1	41.3	41.6	41.9	42.1	42.3
1979	45.6	42.7	42.9	43.7	44.0	44.2	44.8	46.4	47.1	47.6	47.9	48.0	48.2
1980	51.9	48.6	49.1	49.4	49.9	50.5	51.3	52.1	52.6	53.7	54.7	55.2	55.8
1981	59.8	56.1	57.0	57.4	57.7	58.1	58.8	60.1	61.1	62.1	62.7	63.1	63.6
1982	68.6	63.9	64.7	66.1	67.2	67.7	68.2	68.8	69.6	70.8	71.7	72.1	72.3
1983	77.1	73.2	74.4	75.2	75.8	76.3	76.6	77.2	78.0	78.6	79.3	79.8	80.3
1984	86.0	80.7	81.8	82.8	84.1	84.7	85.6	86.7	87.3	88.1	89.3	90.3	90.9
1985	100.0	92.0	94.9	95.3	97.3	98.4	99.6	100.5	101.6	102.7	104.3	105.6	107.7
1986	118.6	111.0	112.0	113.3	[illegible]	115.6	116.5	118.8	120.6	122.9	124.2	125.9	127.2
1987	137.7	128.9	130.3	132.4	134.1	135.6	136.6	138.2	140.2	142.0	143.6	144.8	145.9
1988	155.4	147.2	148.2	150.2	151.9	153.1	153.6	155.3	157.4	159.6	161.3	162.7	164.2
1989	178.2	166.8	168.2	170.9	173.1	175.9	177.7	179.3	181.8	183.4	185.1	187.0	189.4
1990	203.8	192.0	193.3	196.4	198.3	200.4	201.8	203.2	206.5	209.7	211.1	215.6	217.1

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SOUTH AFRICA *(continued)*

PRODUCER PRICE INDEX (1980=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1971	17.0	16.5	16.5	16.6	16.8	16.9	17.0	17.1	17.1	17.2	17.3	17.3	17.3
1972	18.3	17.4	17.7	17.8	17.9	18.0	18.2	18.4	18.6	18.8	19.0	19.1	19.2
1973	20.5	19.4	19.7	20.0	20.1	20.4	20.6	20.8	21.2	21.4	21.6	21.9	22.1
1974	24.5	22.3	22.6	22.8	23.3	23.8	24.5	24.8	25.6	25.8	25.9	26.2	26.4
1975	28.7	27.0	27.3	27.3	27.5	28.0	28.3	28.8	29.5	29.6	30.1	30.5	30.9
1976	33.1	30.9	31.4	31.4	31.9	32.5	32.8	33.2	33.9	34.4	34.6	34.7	35.3
1977	37.3	35.5	36.0	36.2	36.5	37.0	37.5	37.8	38.0	38.1	38.3	38.5	38.7
1978	41.0	39.5	39.7	39.7	40.1	40.5	40.7	41.0	41.5	41.9	42.3	42.7	42.8
1979	47.3	43.3	43.7	44.2	44.6	45.9	46.9	48.4	49.2	49.6	50.1	50.5	50.8
1980	55.2	51.9	51.9	52.2	52.9	53.6	54.3	55.4	56.5	57.4	58.3	59.1	59.3
1981	62.7	59.6	60.3	60.3	60.8	61.3	61.9	62.8	64.0	64.5	65.2	65.9	66.2
1982	71.4	67.0	68.1	68.2	69.5	70.3	70.9	71.6	72.8	73.2	74.7	75.4	75.6
1983	79.0	76.1	76.8	77.3	77.8	78.8	78.5	78.7	80.1	80.3	80.8	80.9	81.5
1984	85.6	81.4	82.3	82.7	83.4	84.1	84.8	85.1	86.4	87.4	88.7	89.9	90.7
1985	100.0	92.0	94.6	95.5	96.0	98.1	98.9	99.7	101.1	102.0	103.8	108.2	110.1
1986	119.6	112.4	114.2	114.2	115.3	117.3	117.7	119.4	121.6	122.5	125.2	127.1	128.1
1987	136.2	129.1	130.8	132.3	133.9	134.5	135.2	136.2	137.9	139.3	141.0	141.9	142.6
1988	154.1	144.3	146.7	148.2	150.5	152.4	153.6	154.8	156.5	157.9	159.5	162.0	163.3
1989	177.6	165.5	168.6	171.1	173.9	176.4	177.1	178.8	180.8	181.8	183.9	185.6	187.2
1990	198.9	188.9	190.3	190.8	194.1	196.6	197.2	197.3	199.-	202.2	205.5	212.7	212.0

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HISTORICAL GOVERNMENT STATISTICS

UNITED STATES

PRODUCER PRICE INDEX — Industrial Commodities (1982=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	32.0	31.9	31.9	31.9	31.9	31.9	31.9	31.9	32.0	32.1	32.2	32.3	32.4
1968	32.8	32.5	32.7	32.7	32.8	32.8	32.8	32.8	32.8	32.9	33.1	33.1	33.2
1969	33.9	33.4	33.6	33.7	33.8	33.8	33.8	33.8	34.0	34.1	34.3	34.4	34.5
1970	35.2	34.7	34.8	34.8	35.0	35.1	35.2	35.3	35.3	35.4	35.6	35.6	35.8
1971	36.5	35.9	36.0	36.2	36.3	36.4	36.5	36.7	36.9	36.9	36.9	36.8	37.0
1972	37.8	37.1	37.3	37.4	37.5	37.7	37.8	37.8	37.9	38.0	38.0	38.1	38.2
1973	40.3	38.4	38.8	39.3	39.8	40.1	40.3	40.4	40.6	40.8	41.1	41.7	42.3
1974	49.2	43.3	44.2	45.6	46.9	48.2	49.2	50.5	51.7	52.1	52.8	53.1	53.2
1975	54.9	53.6	53.9	54.1	54.3	54.5	54.6	54.8	55.1	55.4	56.0	56.1	56.4
1976	58.4	56.8	57.0	57.3	57.7	57.8	58.1	58.5	58.9	59.2	59.7	59.9	60.0
1977	62.5	60.3	60.9	61.4	61.9	62.2	62.3	62.7	63.1	63.3	63.7	63.8	64.1
1978	67.0	64.6	65.0	65.4	66.0	66.4	66.8	67.3	67.7	68.0	68.7	69.2	69.6
1979	75.7	70.5	71.3	72.2	73.[illegible]	74.2	74.9	76.1	77.0	78.2	79.7	80.3	81.1
1980	88.0	83.4	85.1	86.0	86.9	87.1	87.6	88.4	89.1	89.3	90.3	90.7	91.8
1981	97.4	93.3	94.7	95.9	97.2	97.6	97.7	98.1	98.4	98.4	99.0	99.0	99.3
1982	100.0	99.8	99.8	99.6	99.2	99.1	99.5	100.2	100.3	100.1	100.6	100.9	100.9
1983	101.1	100.5	100.5	100.4	100.0	100.4	100.9	101.4	101.6	101.5	102.0	101.9	102.0
1984	103.3	102.2	102.7	103.1	103.3	103.5	103.7	103.7	103.5	103.2	103.6	103.7	103.4
1985	103.7	103.4	103.2	103.3	103.7	104.2	104.0	103.9	103.7	103.2	103.8	104.0	104.1
1986	100.0	103.7	102.1	100.5	99.8	99.8	99.8	98.8	98.6	98.8	99.1	99.2	99.2
1987	102.6	100.4	100.8	101.1	101.6	101.9	102.4	103.1	103.7	103.5	104.0	104.2	104.1
1988	106.3	104.3	104.6	104.7	105.6	106.1	106.5	106.7	107.1	106.8	107.1	107.4	108.1
1989	111.6	109.4	110.1	110.5	111.8	112.1	112.4	112.2	111.4	111.9	112.4	112.2	112.3
1990	115.8	114.1	113.6	113.2	113.2	113.5	113.2	113.4	115.9	118.4	121.4	120.7	119.0

PRODUCER PRICE INDEX — All Commodities (1982=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	33.4	33.4	33.4	33.3	33.1	33.3	33.5	33.5	33.4	33.4	33.4	33.4	33.7
1968	34.2	33.8	34.0	34.1	34.1	34.2	34.2	34.3	34.2	34.4	34.4	34.5	34.6
1969	35.6	34.8	35.0	35.2	35.3	35.5	35.7	35.8	35.7	35.8	35.9	36.1	36.3
1970	36.9	36.5	36.7	36.7	36.8	36.8	36.9	37.1	36.9	37.1	37.1	37.1	37.1
1971	38.1	37.3	37.7	37.8	37.9	38.1	38.2	38.3	38.5	38.3	38.3	38.3	38.6
1972	39.8	38.8	39.2	39.2	39.3	39.5	39.7	40.0	40.1	40.2	40.1	40.3	41.1
1973	45.0	41.6	42.4	43.4	43.6	44.5	45.5	44.9	47.5	46.7	46.3	46.5	47.4
1974	53.5	49.0	50.0	50.6	51.0	51.8	52.0	54.0	55.9	55.9	56.9	57.4	57.3
1975	58.4	57.4	57.2	56.9	57.5	57.9	58.0	58.7	59.0	59.4	59.8	59.5	59.7
1976	61.1	59.9	59.9	60.0	60.6	60.8	61.2	61.6	61.4	61.8	61.9	62.0	62.5
1977	64.9	62.8	63.5	64.1	64.9	65.2	65.0	65.1	65.0	65.3	65.6	65.8	66.2
1978	69.9	66.8	67.5	68.1	69.0	69.5	70.0	70.4	70.4	71.0	71.8	72.1	72.7
1979	78.7	73.8	74.9	75.8	76.9	77.5	78.0	79.2	79.6	80.9	82.1	82.6	83.4
1980	89.8	85.2	86.9	87.5	87.8	88.3	88.7	90.3	91.5	91.7	92.8	93.2	93.8
1981	98.0	95.2	96.1	97.0	98.0	98.3	98.5	99.0	99.0	98.8	98.9	98.8	98.8
1982	100.0	99.7	99.8	99.6	99.6	99.8	100.0	100.4	100.3	100.0	100.2	100.3	100.5
1983	101.3	100.2	100.5	100.4	100.4	100.8	101.1	101.3	101.8	102.0	102.2	102.1	102.3
1984	103.7	102.9	103.2	103.9	104.0	104.1	104.0	104.2	103.8	103.4	103.4	103.7	103.5
1985	103.2	103.4	103.3	103.1	103.3	103.5	103.3	103.2	102.7	102.1	102.9	103.4	103.6
1986	100.2	103.2	101.7	100.3	99.6	100.0	99.9	99.4	99.3	99.4	99.7	99.8	99.7
1987	102.8	100.5	101.0	101.2	101.9	102.6	103.0	103.5	103.8	103.7	104.1	104.2	104.1
1988	106.9	104.5	104.8	104.9	105.8	106.5	107.4	107.8	108.0	108.1	108.2	108.3	109.0
1989	112.2	110.5	110.8	111.5	112.3	113.2	112.9	112.8	112.0	112.4	112.8	112.7	113.0
1990	116.3	114.9	114.4	114.2	114.1	114.6	114.3	114.5	116.5	118.4	120.8	120.1	118.7

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UNITED STATES *(continued)*

CONSUMER PRICE INDEX (1982-1984=100)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	33.4	32.9	32.9	33.0	33.1	33.2	33.4	33.4	33.5	33.6	33.7	33.8	33.9
1968	34.8	34.1	34.2	34.3	34.4	34.5	34.7	34.9	35.0	35.1	35.3	35.4	35.5
1969	36.7	35.6	35.8	36.1	36.3	36.4	36.6	36.8	37.0	37.1	37.3	37.5	37.7
1970	38.8	37.8	38.0	38.2	38.5	38.6	38.8	39.0	39.0	39.2	39.4	39.6	39.8
1971	40.5	39.8	39.9	40.0	40.1	40.3	40.6	40.7	40.8	40.8	40.9	40.9	41.1
1972	41.8	41.1	41.3	41.4	41.5	41.6	41.7	41.9	42.0	42.1	42.3	42.4	42.5
1973	44.4	42.6	42.9	43.3	43.6	43.9	44.2	44.3	45.1	45.2	45.6	45.9	46.2
1974	49.3	46.6	47.2	47.8	48.0	48.6	49.0	49.4	50.0	50.6	51.1	51.5	51.9
1975	53.8	52.1	52.5	52.7	52.9	53.2	53.6	54.2	54.3	54.6	54.9	55.3	55.5
1976	56.9	55.6	55.8	55.9	56.1	56.5	56.8	57.1	57.4	57.6	57.9	58.0	58.2
1977	60.6	58.5	59.1	59.5	60.0	60.3	60.7	61.0	61.2	61.4	61.6	61.9	62.1
1978	65.2	62.5	62.9	63.4	63.9	64.5	65.2	65.7	66.0	66.5	67.1	67.4	67.7
1979	72.6	68.3	69.1	69.8	70.6	71.5	72.3	73.1	73.8	74.6	75.2	75.9	76.7
1980	82.4	77.9	78.9	80.1	81.0	81.8	82.7	82.7	83.3	84.0	84.8	85.5	86.3
1981	90.9	87.0	87.9	88.5	89.1	89.8	90.6	91.6	92.3	93.2	93.4	93.7	94.0
1982	96.5	94.3	94.6	94.5	94.9	95.8	97.0	97.5	97.7	97.9	98.2	98.0	97.6
1983	99.6	97.8	97.9	97.9	98.6	99.2	99.5	99.9	100.2	100.7	101.0	101.2	101.3
1984	103.9	101.9	102.4	102.6	103.1	103.4	103.7	104.1	104.5	105.0	105.3	105.3	105.3
1985	107.6	105.5	106.0	106.4	106.9	107.3	107.6	107.8	108.0	108.3	108.7	109.0	109.3
1986	109.6	109.6	109.3	108.8	108.6	108.9	109.5	109.5	109.7	110.2	110.3	110.4	110.5
1987	113.6	111.2	111.6	112.1	112.7	113.1	113.5	113.8	114.4	115.0	115.3	115.4	115.4
1988	118.3	115.7	116.0	116.5	117.1	117.5	118.0	118.5	119.0	119.8	120.2	120.3	120.5
1989	124.0	121.1	121.6	122.3	123.1	123.8	124.1	124.4	124.6	125.0	125.6	125.9	126.1
1990	130.7	127.4	128.0	128.7	128.9	129.2	129.9	130.4	131.6	132.7	133.5	133.8	133.8

GROSS AVERAGE HOURLY EARNINGS of Production or Non-supervisory Workers (US$)–Metal Mining (SIC 10)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	3.24	3.20	3.20	3.23	3.24	3.23	3.25	3.24	3.24	3.29	3.28	3.28	3.29
1968	3.42	3.31	3.32	3.31	3.37	3.37	3.40	3.41	3.47	3.51	3.48	3.51	3.51
1969	3.64	3.51	3.53	3.54	3.60	3.62	3.64	3.65	3.69	3.72	3.73	3.73	3.74
1970	3.88	3.75	3.77	3.77	3.83	3.85	3.88	3.91	3.91	4.01	3.96	3.99	3.96
1971	4.12	3.95	3.93	3.96	4.03	4.03	4.03	3.99	4.30	4.38	4.30	4.28	4.35
1972	4.56	4.46	4.44	4.46	4.49	4.47	4.48	4.59	4.64	4.69	4.65	4.65	4.68
1973	4.84	4.68	4.71	4.71	4.77	4.74	4.75	4.80	4.85	4.98	4.97	5.00	5.02
1974	5.44	5.10	5.12	5.15	5.29	5.29	5.31	5.36	5.53	5.68	5.75	5.80	5.86
1975	6.13	5.90	5.90	5.89	5.93	6.00	6.02	6.11	6.23	6.35	6.38	6.40	6.44
1976	6.76	6.53	6.51	6.55	6.64	6.63	6.67	6.76	6.89	7.00	6.93	6.99	7.00
1977	7.28	6.95	7.02	7.07	7.12	7.19	7.26	7.32	7.37	7.49	7.52	7.63	7.65
1978	8.23	7.73	7.79	7.84	7.97	8.04	8.08	8.25	8.40	8.56	8.60	8.71	8.72
1979	9.27	8.71	8.81	8.85	9.03	9.06	9.09	9.33	9.39	9.63	9.67	9.79	9.81
1980	10.26	9.92	9.93	9.91	10.01	10.19	10.13	10.24	10.38	10.54	10.58	10.72	10.83
1981	11.55	10.90	11.13	11.11	11.28	11.24	11.29	11.60	11.84	12.10	12.08	12.12	12.07
1982	12.31	12.17	12.22	12.28	12.19	12.21	12.29	12.27	12.31	12.58	12.51	12.55	12.53
1983	12.58	12.56	12.61	12.39	12.51	12.44	12.55	12.59	12.54	12.62	12.68	12.64	12.78
1984	13.05	12.68	12.83	12.89	12.94	13.01	12.99	13.07	13.15	13.24	13.27	13.28	13.32
1985	13.38	13.29	13.31	13.29	13.43	13.24	13.21	13.44	13.55	13.44	13.49	13.49	13.45
1986	12.46	12.22	12.30	12.33	12.42	12.43	12.50	12.50	12.53	12.54	12.53	12.61	12.67
1987	12.52	12.72	12.63	12.58	12.51	12.50	12.52	12.41	12.40	12.50	12.42	12.54	12.60
1988	13.24	13.01	13.14	13.16	13.14	13.04	13.23	13.29	13.34	13.28	13.34	13.33	13.56
1989	13.59	13.72	13.58	13.63	13.60	13.51	13.54	13.61	13.56	13.63	13.69	13.62	13.45
1990	14.10	13.69	13.70	13.80	13.92	13.96	14.00	14.29	14.27	14.41	14.43	14.34	14.39

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UNITED STATES *(continued)*

GROSS AVERAGE HOURLY EARNINGS of Production or Non-supervisory Workers –Primary Non-ferrous Metals (SIC 333)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	3.26	3.18	3.19	3.19	3.20	3.20	3.25	3.27	3.31	3.34	3.34	3.35	3.36
1968	3.48	3.38	3.36	3.38	3.48	3.36	3.45	3.47	3.52	3.53	3.53	3.56	3.58
1969	3.68	3.59	3.58	3.58	3.62	3.64	3.71	3.73	3.73	3.75	3.74	3.75	3.76
1970	3.87	3.78	3.77	3.76	3.80	3.83	3.88	3.94	3.92	3.98	3.90	3.92	3.95
1971	4.15	3.95	3.95	3.95	3.96	3.98	4.15	4.32	4.35	4.34	4.28	4.29	4.40
1972	4.59	4.47	4.45	4.46	4.47	4.47	4.57	4.63	4.65	4.69	4.68	4.73	4.77
1973	4.98	4.79	4.79	4.83	4.82	4.85	4.96	5.03	5.04	5.10	5.12	5.15	5.22
1974	5.63	5.21	5.31	5.43	5.50	5.49	5.59	5.68	5.76	5.83	5.86	5.87	5.93
1975	6.24	5.97	5.96	6.04	6.04	6.07	6.25	6.34	6.40	6.49	6.53	6.52	6.44
1976	6.87	6.54	6.52	6.64	6.74	6.71	6.82	6.91	6.96	7.07	7.10	7.18	7.18
1977	7.67	7.16	7.20	7.24	7.34	7.37	7.71	7.83	7.78	8.01	8.07	8.12	8.15
1978	8.56	8.24	8.28	8.27	8.32	8.36	8.56	8.62	8.66	8.74	8.83	8.86	8.97
1979	9.50	9.00	9.01	9.11	9.49	9.14	9.44	9.57	9.70	9.79	9.87	9.86	9.92
1980	10.63	10.06	10.02	10.24	10.31	10.3[illegible]	10.70	10.84	10.80	10.95	11.01	11.08	11.33
1981	11.98	11.32	11.36	11.51	11.64	11.70	11.90	12.22	12.12	12.72	12.45	12.51	12.48
1982	12.93	12.69	12.64	12.73	12.72	12.74	12.94	12.94	13.00	13.50	13.25	13.21	13.04
1983	13.43	13.32	13.28	13.33	13.33	13.60	13.37	13.55	13.46	13.45	13.54	13.55	13.32
1984	13.43	13.37	13.33	13.32	13.29	13.36	13.39	13.35	13.51	13.39	13.54	13.76	13.66
1985	13.74	13.71	13.74	13.98	13.63	13.60	13.67	13.83	13.70	13.67	13.65	13.95	13.79
1986	13.48	13.68	13.80	13.91	13.89	13.79	13.50	13.29	13.11	13.25	13.14	13.13	13.01
1987	12.98	12.96	12.80	12.76	12.84	12.87	12.88	13.02	13.01	13.29	12.99	13.11	13.14
1988	13.26	13.02	12.96	13.20	13.20	13.14	13.18	13.31	13.31	13.40	13.43	13.43	13.48
1989	13.72	13.49	13.47	13.51	13.63	13.54	13.59	13.68	13.67	13.93	13.91	14.08	14.14
1990	14.36	13.95	13.99	14.04	14.30	14.16	14.31	14.49	14.60	14.48	14.58	14.73	14.69

GROSS AVERAGE HOURLY EARNINGS of Production or Non-supervisory Workers–Chemicals & Allied Products (SIC 28)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	3.10	3.04	3.05	3.05	3.06	3.07	3.10	3.13	3.12	3.14	3.15	3.16	3.17
1968	3.26	3.20	3.19	3.19	3.22	3.23	3.26	3.28	3.29	3.31	3.31	3.33	3.36
1969	3.47	3.37	3.37	3.38	3.41	3.43	3.46	3.49	3.50	3.52	3.55	3.57	3.58
1970	3.69	3.60	3.60	3.60	3.62	3.64	3.68	3.71	3.73	3.78	3.77	3.79	3.81
1971	3.97	3.84	3.85	3.85	3.90	3.92	3.96	4.02	4.02	4.06	4.04	4.04	4.11
1972	4.26	4.15	4.17	4.17	4.18	4.22	4.25	4.28	4.29	4.35	4.34	4.34	4.38
1973	4.51	4.41	4.40	4.40	4.44	4.46	4.49	4.53	4.54	4.57	4.59	4.62	4.64
1974	4.88	4.67	4.68	4.69	4.75	4.76	4.82	4.91	4.94	5.01	5.04	5.10	5.15
1975	5.39	5.17	5.18	5.21	5.24	5.31	5.37	5.43	5.46	5.51	5.53	5.59	5.63
1976	5.91	5.68	5.71	5.72	5.80	5.82	5.87	5.95	5.96	6.05	6.07	6.11	6.16
1977	6.43	6.19	6.20	6.23	6.30	6.33	6.39	6.47	6.49	6.57	6.62	6.66	6.73
1978	7.02	6.78	6.82	6.84	6.87	6.94	6.97	7.05	7.06	7.14	7.20	7.23	7.29
1979	7.60	7.33	7.33	7.37	7.52	7.48	7.54	7.61	7.66	7.74	7.83	7.89	7.93
1980	8.31	7.98	8.01	8.06	8.13	8.18	8.25	8.37	8.40	8.47	8.53	8.60	8.69
1981	9.12	8.75	8.80	8.85	8.95	8.99	9.06	9.16	9.18	9.37	9.36	9.41	9.51
1982	9.96	9.67	9.67	9.70	9.79	9.81	9.94	10.01	10.01	10.19	10.23	10.26	10.32
1983	10.58	10.34	10.42	10.40	10.44	10.50	10.51	10.58	10.61	10.69	10.77	10.84	10.87
1984	11.07	10.88	10.87	10.91	10.94	10.99	11.00	11.09	11.09	11.19	11.28	11.31	11.33
1985	11.57	11.38	11.38	11.36	11.47	11.45	11.51	11.59	11.61	11.66	11.71	11.81	11.86
1986	11.98	11.87	11.83	11.80	11.84	11.90	11.95	12.05	11.99	12.03	12.08	12.17	12.20
1987	12.37	12.17	12.21	12.24	12.30	12.32	12.28	12.37	12.33	12.56	12.50	12.55	12.61
1988	12.71	12.59	12.58	12.57	12.61	12.62	12.64	12.75	12.67	12.80	12.83	12.90	12.95
1989	13.09	12.90	12.92	12.95	12.95	13.01	13.00	13.15	13.10	13.20	13.27	13.28	13.32
1990	13.54	13.34	13.27	13.34	13.53	13.46	13.51	13.58	13.57	13.62	13.72	13.73	13.75

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UNITED STATES *(continued)*

GROSS AVERAGE HOURLY EARNINGS of Production or Non-supervisory Workers
Electronic & Electronic Equipment (SIC 36)

Year	Average	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1967	2.77	2.70	2.72	2.73	2.74	2.76	2.78	2.79	2.78	2.78	2.81	2.83	2.86
1968	2.93	2.87	2.87	2.88	2.87	2.90	2.91	2.92	2.92	2.95	2.98	3.00	3.00
1969	3.09	3.04	3.04	3.04	3.06	3.07	3.08	3.09	3.10	3.13	3.13	3.12	3.16
1970	3.28	3.17	3.20	3.23	3.24	3.26	3.29	3.31	3.30	3.32	3.31	3.33	3.41
1971	3.49	3.42	3.42	3.45	3.45	3.48	3.48	3.50	3.50	3.52	3.52	3.53	3.61
1972	3.71	3.62	3.64	3.65	3.66	3.68	3.69	3.70	3.72	3.76	3.76	3.78	3.83
1973	3.91	3.83	3.82	3.82	3.85	3.86	3.88	3.92	3.95	3.98	3.99	3.99	4.06
1974	4.21	4.05	4.04	4.06	4.06	4.13	4.20	4.22	4.22	4.32	4.37	4.40	4.49
1975	4.64	4.49	4.50	4.54	4.56	4.59	4.64	4.66	4.67	4.73	4.73	4.76	4.83
1976	4.96	4.81	4.81	4.84	4.80	4.86	4.87	4.95	5.00	5.07	5.11	5.13	5.20
1977	5.39	5.23	5.22	5.24	5.26	5.29	5.34	5.39	5.44	5.50	5.51	5.55	5.64
1978	5.82	5.65	5.67	5.67	5.69	5.72	5.74	5.83	5.86	5.94	5.95	5.98	6.10
1979	6.31	6.12	6.14	6.17	6.12	6.22	6.26	6.28	6.36	6.46	6.48	6.51	6.63
1980	6.94	6.66	6.70	6.76	6.78	6.76	6.85	6.94	6.99	7.11	7.16	7.25	7.35
1981	7.62	7.37	7.40	7.44	7.47	7.51	7.57	7.65	7.74	7.76	7.82	7.84	7.92
1982	8.21	8.00	7.98	8.04	8.06	8.09	8.14	8.22	8.29	8.36	8.40	8.43	8.50
1983	8.66	8.52	8.55	8.58	8.58	8.59	8.63	8.70	8.64	8.76	8.74	8.80	8.80
1984	9.04	8.91	8.91	8.94	8.94	8.94	8.96	9.00	9.05	9.13	9.14	9.20	9.32
1985	9.46	9.33	9.32	9.38	9.40	9.39	9.46	9.47	9.49	9.54	9.54	9.59	9.67
1986	9.65	9.58	9.57	9.60	9.60	9.63	9.59	9.66	9.64	9.69	9.66	9.72	9.81
1987	9.88	9.82	9.82	9.82	9.81	9.81	9.83	9.86	9.98	9.94	9.92	9.98	10.03
1988	9.79	9.66	9.66	9.67	9.74	9.76	9.79	9.77	9.81	9.87	9.85	9.93	9.99
1989	10.05	9.99	9.97	9.99	9.99	10.00	10.05	10.08	10.06	10.13	10.08	10.11	10.14
1990	10.32	10.13	10.16	10.17	10.17	10.22	10.27	10.34	10.33	10.42	10.47	10.53	10.57

GROSS NATIONAL PRODUCT IMPLICIT PRICE DEFLATOR (1982=100) — for the quarter ending

Year	Average	Year	Average	Year	Average	Year	Average
1967	35.9	1973	49.5	1979	78.6	1985	110.9
1968	37.7	1974	54.0	1980	85.7	1986	113.9
1969	39.8	1975	59.3	1981	94.0	1987	117.7
1970	42.0	1976	63.1	1982	100.0	1988	121.3
1971	44.4	1977	67.3	1983	103.9	1989	126.3
1972	46.5	1978	72.2	1984	107.7	1990	131.5

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NUCLEAR INDUSTRY CALENDAR

1991	
Oct. 24	***Canadian Participation in World Fusion: Opportunities and Challenges*** (Skyline Hotel, Ottawa, Canada). Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society. Contact: Sylvie Caron, CNA; 416-977-6152; Fax: 416-979-8356; or mail: 144 Front St., Suite 725, Toronto, Ontario, Canada M5J 2L7.
Oct. 29-31	***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee). Sponsored by Martin Marietta Energy Systems, Inc. Contact: Diane Duck, MMES; 615-576-1676; or Fax: 615-576-1561.
Nov. 10-13	***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Nov. 10-15	***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California). Contact: ANS Meetings Department: 708-352-6611.
Nov. 13-14	***Nuclear Power—A Fresh Start*** (Marriott Hotel, London, United Kingdom). Sponsored by the Government of the United Kingdom. Contact: Amanda Wright, IBC Technical Services; IBC Hse., Canada Rd., Byfleet, Surrey KT14 7JL, UK; Phone: 071-236-4080; Fax: 071-489-0849.
Nov. 14-15	***World Electricity Conference*** (Hotel Inter-Continental, London, United Kingdom). Sponsored by the Financial Times and Power In Europe. Contact: FT Conference Organization; 126 Jermyn Street, London SW1Y 4UJ, UK; Phone: 071-925-2323; Fax: 071-925-2125; Telex: 27347 FTCONF G.
Dec. 2-4	***PLEX '91 BERLIN – Nuclear Plant Life Extension, Upgrading, Repair, Refurbishment, Uprating and Ageing*** (Hotel Steigenberger, Berlin, Germany). Sponsored by Nuclear Engineering International. Contact: Conference (PLEX); Status Meetings Ltd., Festival Hall, Petersfield, Hampshire, GU31 4JW, UK; Phone: 44-730-66544; Fax: 44-730-68865; Telex: 86105 CONFER G.
1992	
Feb. 23-25	***INFO Centers Workshop*** (Marriott Hotel, Palm Beach Gardens, Florida). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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1992
(continued)

March 22-25	***Fuel Cycle Conference '92*** (OMNI Charleston Hotel, Charleston, South Carolina). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
April 12-16	***8th Pacific Basin Conference*** (Taipei, Taiwan). Sponsored by the Amercian Nuclear Society. Contact: ANS Meetings Department: 708-352-6611.
April 26-28	***INFO '92 Conference*** (OMNI Charlotte Hotel, Charlotte, North Carolina). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
May 5-7	***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany). Sponsored by the German Nuclear Society and the German Atomic Forum. Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.
Sept. 20-23	***International Uranium Seminar '92*** (Hyatt Regency Hotel, Lake Tahoe, Nevada). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.
Sept. 21-23	***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom). Sponsored by the Institution of Nuclear Engineers. Contact: INE Conference Secretary: 081-698-1500 or 081-698-4750; Fax: 018-695-6409.
Nov. 15-18	***Nuclear Energy Forum*** (Fairmont Hotel, Chicago, Illinois). Sponsored by the U. S. Council for Energy Awareness. Contact: USCEA Conference Office: 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

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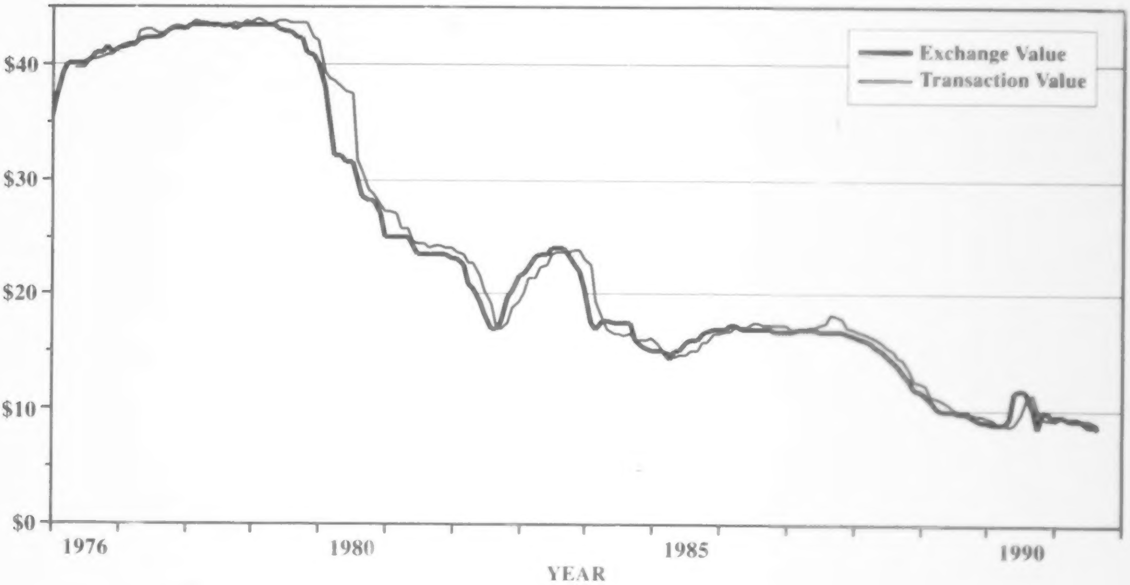
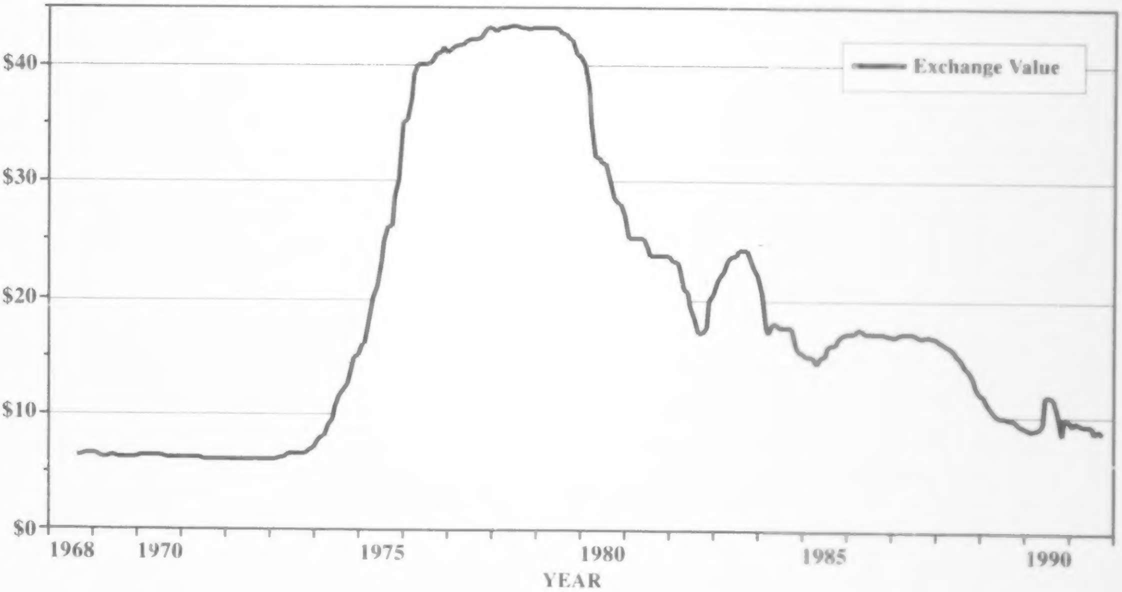
HISTORICAL MARKET DATA

NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)





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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated (\$US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	8.75	**8.40**			

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated (\$US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF$_6$ Values

Year	Determined as of the last day of the month indicated ($US/kg U as UF$_6$)											
	Jan	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	26.25	**25.50**			

US Premium (Relative to the UF$_6$ Value)

Year	Determined as of the last day of the month indicated ($US/kg U as UF$_6$)											
	Jan	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Year	Determined as of the last day of the month indicated ($US/lb U as UF$_6$)											
	Jan	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	1.60	**1.55**			

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Transaction Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.90
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	8.95	**8.70**			

SWU Values

Determined as of the last day of the month indicated ($US per SWU)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	67	**67**			

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Loan Rates

Determined as of the last day of the month indicated (Percent per Annum)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**			

* Float with Prime Rate

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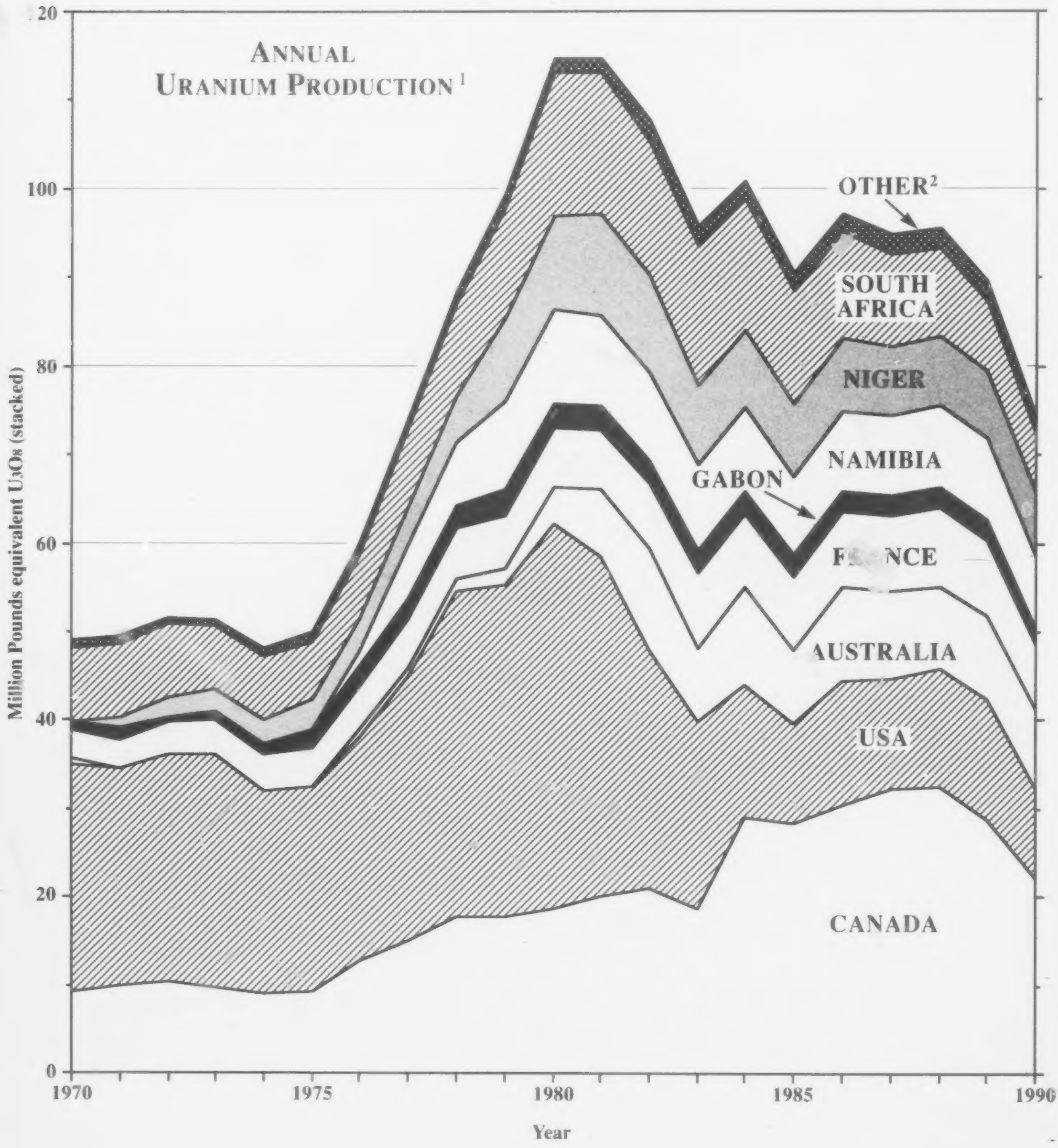

[1] Estimated world uranium production in 1990 totalled 85.2 million pounds equivalent U_3O_8 —
(Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2)

[2] Other includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia

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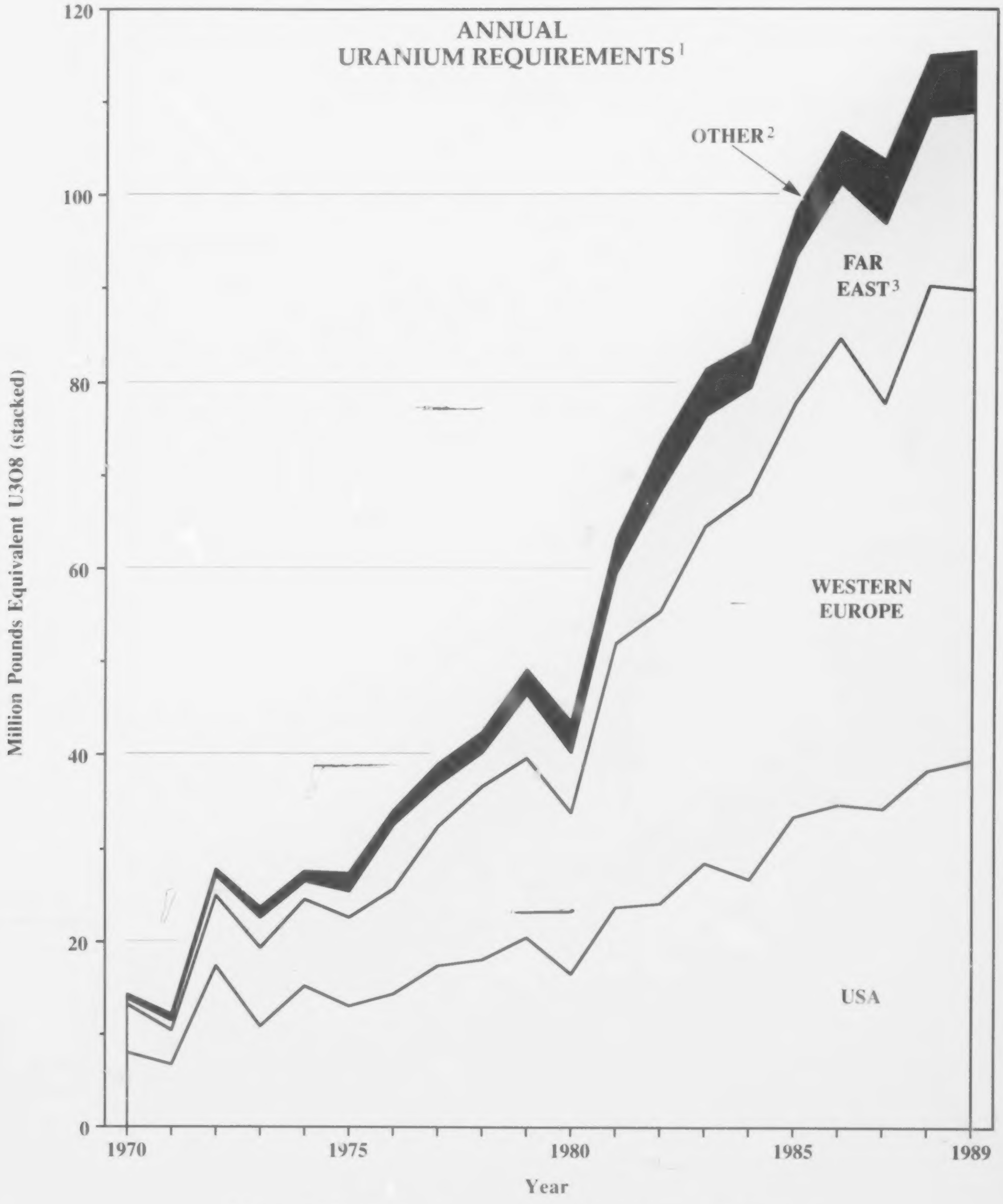
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include: Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg.	95.8	83.1	—	69.6 **R**
1981	Avg.	105.0	85.9	—	76.1 **R**
1982	Avg.	116.7	89.0	—	86.4 **R**
1983	Avg.	128.5	96.9	—	89.9 **R**
1984	Avg.	133.6	98.0	—	96.0 **R**
1985	Avg.	142.6	107.3	—	100.1 **R**
1986	Avg.	155.5	101.5	—	104.9 **R**
1987	Avg.	168.7	108.9	465.88	112.9 **R**
1988	Avg.	180.9	111.8	496.90	115.4 **R**
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0
Sept	1990	208.9	128.2	—	130.2
Oct	1990	—	134.1	—	130.4
Nov	1990	—	133.7	589.20	130.4
Dec	1990	214.5	128.8	—	130.6
Jan	1991	—	125.6	—	130.6
Feb	1991	—	121.5	597.70	130.6 **R**
Mar	1991	214.1	119.1	—	130.8 **R**
Apr	1991	—	117.6	—	131.0 **R**
May	1991	—	117.8	592.00	131.0 **R**
June	1991	214.4	120.4	—	131.0 **R**
July	1991	—	120.4	—	130.9

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1990 appears in Report 278.

[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.

[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).

[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).

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GOVERNMENT STATISTICS

Canada

		Industrial Products Price Index: All Commodities[1] (1986 = 100)[2]	Consumer Price Index: All Items (1986 = 100)[3]	Wage-earner Data: Average Hourly Earnings (C$)[4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.9 **R**	67.2 **R**	–·–	–·–	–·–	–·–	–·–
1981	Avg.	83.6 **R**	75.5	–·–	–·–	–·–	–·–	–·–
1982	Avg.	89.0	83.7	–·–	–·–	–·–	–·–	–·–
1983	Avg.	92.1	88.5	17.22	14.86	14.18	10.67	11.09 **R**
1984	Avg.	96.3	92.4 **R**	17.89	15.85	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.47 **R**	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.8 **R**	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	107.2 **R**	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6	126.1	24.38	22.17	20.25	15.05	16.55
June	1991	108.5	126.7	23.58 **P**	22.13 **P**	19.90 **P**	14.65 **P**	16.51 **P**
July	1991	108.2	126.8	–·–	–·–	–·–	–·–	–·–

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Monthly data for the period 1967 to 1990 is found in Report 278.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1990 is found in Report 278.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled[1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled[2] (March 1982 = 100)	Consumer Price Index[3] (1985 = 100)	Production Price Index All Groups[4] (1985 = 100)	Total Employment in Mining and Quarrying[5]	Total Salaries and Wages in Mining and Quarrying[5] (1,000 Rand)
							Annual Total[6]
1980	Avg.	35.50 **R**	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.87 **R**	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.23 **R**	103.9 **R**	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.70 **R**	151.7 **R**	100.0	100.0	724,587	4,778,612
1986	Avg.	80.18 **R**	177.9	118.6	119.6 **R**	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	198.9 **R**	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.9 **R**	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.8 **R**	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.6 **R**	613,527	719,191
June	1990	128.25	299.87	201.8	197.2 **R**	676,621	841,165
July	1990	—	—	203.2	197.3 **R**	697,242	913,177
Aug	1990	—	—	206.5	199.4 **R**	686,385	902,392
Sept	1990	129.46	312.55	209.7	202.2 **R**	689,317	922,454
Oct	1990	—	—	211.1	205.5 **R**	676,833	882,603
Nov	1990	—	—	215.6	212.7 **R**	669,198	909,418
Dec	1990	133.02	312.37	217.1	212.0 **R**	660,151	942,831
Jan	1991	—	—	219.5	216.1	648,944	935,839
Feb	1991	—	—	222.2	216.9	650,948	893,373
Mar	1991	137.66	323.82	224.1	215.3	651,843 **R**	924,930 **R**
Apr	1991	—	—	227.3	216.5	639,939 **R**	887,722 **R**
May	1991	—	—	230.8	218.4	630,481	887,107
June	1991	134.65	317.23	232.4	219.3	—	—
July	1991	—	—	235.3	221.2	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 278.

[2] Page 16 of Report 178 contains description and calculation of index.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 278.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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GOVERNMENT STATISTICS

United States

		Producer Price Index[1]		Consumer Price Index[2] (1982-1984 = 100)	GNP Implicit Price Deflator[3] (1982 = 100)	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)			Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.31 **R**	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.66 **R**
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.57 **R**	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.32 **R**
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.6 **R**	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52	14.01	10.66
June	1991	116.0	116.3	136.0	136.1	14.88 **R**	14.51 **R**	14.05 **R**	10.74
July	1991	116.0	116.0	136.2	—	15.10 **P**	14.57 **P**	14.14 **R**	10.77 **R**
Aug	1991	116.4	116.2	136.6	—	—.—	—.—	14.08 **P**	10.78 **P**

P = Preliminary **R** = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 278.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 278.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 278.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 278.

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Volume and Price of Uranium Deliveries To The European Community[1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC[2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts[3] Average Price		Spot Contracts[3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] (\$/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium (\$/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	\$16.10	3.6	n/a	1.2
1977	29.9	27.8	\$19.75	5.6	n/a	4.0
1978	37.0	31.6	\$21.60	5.2	n/a	6.8
1979	37.5	33.0	\$23.85	3.0	n/a	6.2
1980	43.7	35.0	\$28.15	3.6	\$43.10	5.8
1981	38.5	32.6	\$34.65	6.6	\$32.90	4.4
1982	26.9	23.5	\$38.37	17.1	\$25.19	6.2
1983	21.2	24.2	\$38.21	8.2	\$26.16	3.3
1984	14.9	22.5	\$32.65	12.5	\$21.86	2.2
1985	11.3	21.7	\$31.43	11.7	\$20.08	5.3
1986	13.5	18.9	\$30.01	13.5	\$20.07	1.6
1987	13.0	20.8	\$27.37	15.1	\$19.14	1.0
1988	13.1	17.6	\$26.15	15.8	\$19.03	3.3
1989	13.8	18.4	\$19.56	13.1	\$16.75	2.1
1990	8.9	20.5	\$15.70	23.7	\$12.55	2.0

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1990: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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